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June 1987



PLANT ASSOCIATIONS OF REGION TWO

Edition 4



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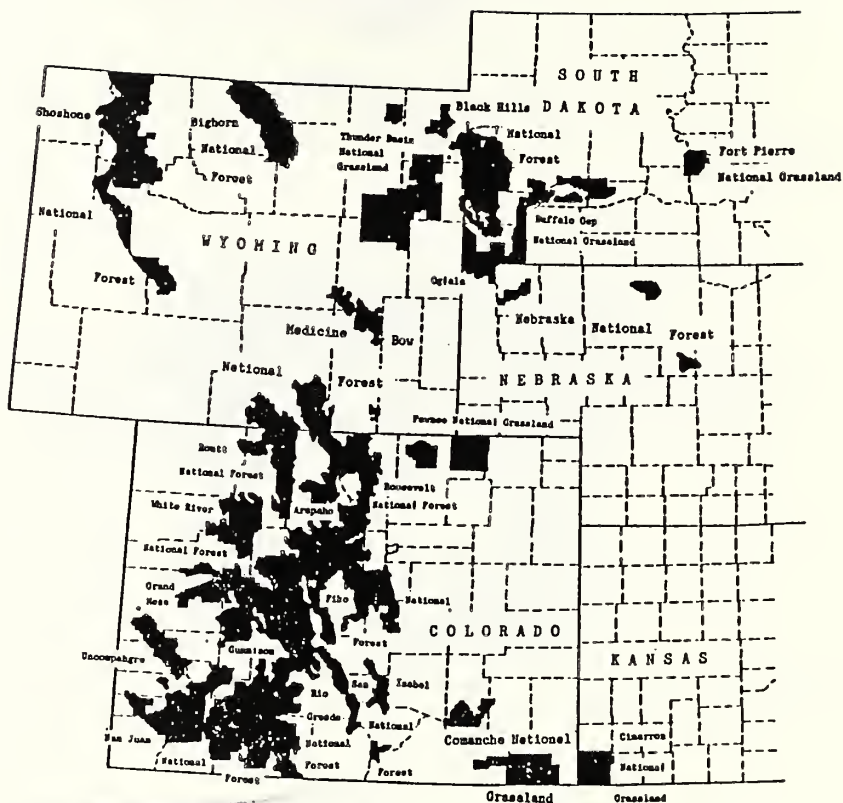
PLANT ASSOCIATIONS OF REGION TWO

Potential plant communities of
Wyoming, South Dakota, Nebraska,
Colorado, and Kansas

Edition 4



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The National Forests (NF) and National Grasslands (NG) of the USDA Forest Service, Rocky Mountain Region (Region 2).

 TABLE OF CONTENTS

Introduction	1
Tabular keys to the plant associations	21
Coniferous Forests	49
Deciduous Forests	151
Woodlands	173
Shrublands	185
Grasslands	251
Forblands	323
APPENDICES	
1. Summary of codes and names	345
2. List of plant species cited	361
3. New species names in Edition 4	379
4. Plant association name changes	383
5. Classification hierarchy	390
6. Bibliography	409
6. Riparian plant associations	427

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1000

INTRODUCTION

1. Summary

This book describes all the plant associations known to occur on National Forests and National Grasslands of the Rocky Mountain Region (Region 2). A plant association is a climax plant community. Plant associations are the fundamental units of plant community classification, and so are the most useful units to use for resource evaluation, modeling, and monitoring. In addition, the plant association classification is the most significant framework for delineation of ecosystems on maps and images, and is also the most significant framework for description and display of management implications and responses.

This book includes keys for each National Forest and most National Grasslands of the Region (beginning on page 21). Each plant association is described by the plant species that dominate it at climax, and by some characteristics of the site it occupies. The known geographical distribution is given for each, within the Region and outside it. Where warranted, phases have been described for significant variations of vegetation and site that subdivide a plant association.

There are some major changes in this edition. A number of plant associations have been added, based on literature that has come to light since the last edition (Appendix 4). Several important plant species names have been changed in this edition (Appendix 3) following recent changes in taxonomic nomenclature. A list of riparian plant associations has been extracted (Appendix 6), to aid land and resource managers in delineating and describing riparian areas.

2. Authority

"The Forest Service encourages the use of plant associations, ecological-type classifications, or a mapped ecosystem framework to coordinate and integrate resource inventories in order to define land and resource production capabilities" (Forest Service Manual 2060.3 - Policy).

Ecosystem classification in the Forest Service "must be based on and describe four components: 1) vegetation, 2) soils, 3) water, and 4) landform" (FSM 2061; F. S. Handbook 2090.11, 02 - Policy). The vegetation component is "defined and described on the basis of existing vegetation or the plant association or both" (FSM 2061.11).

Thus in the Forest Service, the plant association is the basic unit of vegetation classification. The plant association is also the accepted, basic unit of vegetation classification in the multi-agency "Ecological Land Classification Framework" (Driscoll et al. 1984).

3. Cover types

There are several different classification systems available to the resource manager. For example, most inventories describe the current vegetation that occupies a site, called a cover type. Some leading examples of cover type classifications are the Society of American Foresters' classification of forest lands of North America (Eyre 1980), and the "interagency" range cover type classification (Stoddart and Smith 1937).

Classification of cover types alone (without combining it with another classification) is ultimately frustrated by the large number of such types that results from normal resource inventories in the Forest Service. For example, simply listing the two leading plant species that currently dominate each site results in several thousand different cover types on an average-size Ranger District, obviously too many units for a framework that could be used on a day-to-day basis to assemble and describe potentials and implications of management.

The usual solution is to combine these small cover types into larger units based on the leading species, as the SAF and "interagency range type" systems have done. This process results in units that are much too large for normal resource inventories, because they have very large variation in successional patterns, productivity, species composition, soils and landform (Daubenmire 1976). Such large units are usually incapable of supporting decisions based on predicted responses to management activities. For these reasons, cover types are usually retained in inventories in order to partially describe current vegetation, but they are nearly useless as classification units to support resource management decisions.

4. Soil and landform classifications

Soil inventories have been completed for much of this Region, and those inventories justifiably can be used to stratify land according to its potential. A common application of soil inventories is to use soil map units to predict vegetation potentials, either in terms of potential plant communities (Dyksterhuis 1958) or range and woodland production. This application is based on an assumption of correlation between soil map units and vegetation. Soil-vegetation correlation is a study that needs to continue, but assuming it at the beginning defeats both purposes. In addition, vegetation very often correlates poorly with soil units based on USDA taxonomy (Soil Survey Staff 1975; Daubenmire 1970), especially on mountain ranges. This poor correlation of vegetation and soils is expressed both in delineation miscorrelation and in overlap of unit descriptions.

Attempts to correlate vegetation with soil units at a level higher than soil-map units has similar problems of delineation miscorrelation and description overlap. Such higher soil units, called "range sites" or "woodland sites" (USDA 19xx) also have problems similar to those of the SAF and "interagency range" cover type classifications. They are much too large, and thus have intolerably large variation in successional patterns, vegetation, potentials, and responses. In addition, the ecological basis for range sites and woodland sites has been superseded, and is now unused in any modern vegetation inventory (Clements 1916-1920, Dyksterhuis 1958).

Very little progress has been made toward a standard classification of landforms that applies to normal resource inventories. There are several systems available, and all of them have severe difficulties. Only one system has any claim to standardization and applicability, the "Land Systems Inventory" (Wertz and Arnold 1972), based on an hierarchical stratification using regionalization and the ecoregion concept of Bailey (1980). Land Systems Inventory is a system of land stratification that is divisive, that is, beginning with the whole continent and dividing it into successively smaller units. Thus it is not

properly a classification, but since most of its stratification uses landform and geology as primary delineators, it has immersed within it an hierarchical landform classification.

Land Systems Inventory, whether taken as a stratification or as a landform classification, results in small units ("landtype associations", "landtypes", or "sites") that are too highly variable for vegetation potentials and responses. It is possible to inject a vegetation classification level into LSI, but that just brings us back to the primary questions again, without answering them. For what characteristics are vegetation and land (or soils) correlated? This question needs to be continually before us, to be answered by the inventory effort, not assumed at the beginning. What is the best vegetation classification system? That is the question we need now to address.

5. Plant associations as the best vegetation units

For mapping, assembling implications, predicting responses, resource inventory, monitoring, and description of potentials, "the most significant [mapping] of the land surface is that based on climax conditions exclusively" (Daubenmire 1952). The most significant classification of climax vegetation communities that supports mapping is the classification using plant associations (Daubenmire 1952, 1968, 1976, 1978). Most resource mapping in the Forest Service occurs at the standard map scale of 1:24,000. Photointerpretation or image-interpretation at that scale most often yields a map of plant associations.

A plant association is "a kind of plant community represented by stands occurring in places where environments are so closely similar that there is a high degree of floristic uniformity in all layers" (Daubenmire 1978:311). The similarity of both floristics and environment within each plant association defines the level of classification, and makes possible the rejection of such classifications as "range sites", "woodland sites", "landtypes", and soil map units.

This definition also shows that vegetational uniformity, while being the primary criterion for classification, is not the only one. Similarity of environments within a plant association must also be demonstrated, and cannot be assumed, which provides a guideline for testing the circumscription of plant associations when they have been described using vegetation alone. Notice that there are both biotic (vegetation) and abiotic (landform, soils) components to this definition, hence a plant association is an ecological unit.

Plant associations were originally termed "associations" by Daubenmire (1952); the word "plant" was prefixed in more recent years (Daubenmire 1978) to distinguish plant associations from other associations, such as soil associations, landtype associations, grazing associations, and so on.

A habitat type is "a collective term for all parts of the land surface supporting or capable of supporting the same kind of climax plant association" (Daubenmire 1978:315). A habitat type is the map unit that corresponds to one taxonomic unit, that is, one plant association. Each habitat type is named for the single plant association to which it corresponds. Each habitat type delineation that appears on a map (Fig.

1) will contain several to many stands (or sites). Each stand or site within a habitat type is an area with different history and disturbance regime, as compared with adjacent stands or sites. All stands or sites within a habitat type have the same potentials, variable within some limits but clearly distinguishable from all other habitat types. Habitat types can be seen as repeating units in the landscape. Every resource manager should become familiar with the habitat types for his/her area.



Figure 1. Delineation of one habitat type, which includes several stands in different seral stages. Stand numbers are two-digit integers. Ecotones between habitat types are shown in solid line; ecotones between stands are shown in dashed lines.

In the Forest Service, "habitat type" is often used as if it meant the same as "plant association", which is somewhat incorrect, as you can see by comparing the two definitions. In most cases, the two terms can be used synonymously because there is a one-to-one correspondence between the two, and because they carry the same names. Nonetheless, they are different. In general, "plant association" should be used for the climax plant community (the taxonomic unit), and "habitat type" should be used for the land unit (the map unit) to which each plant association corresponds.

Unfortunately, there is linguistic confusion associated with both terms. "Plant association" must always be a climax plant community, which confuses some; a plant association is not just any group of plant species growing together. "Habitat type" needs always to be qualified; habitat for what? "Habitat" is basically a verb, requiring both a subject and an object. Habitat is a concept that applies to any plant or animal species or group of species, and is very different for, say, bristlecone pine and a dragonfly. For these reasons, the recent trend has been away from the term "habitat type" as a taxonomic unit, and in favor of "plant association."

6. Canopy cover to measure dominance

The characteristic of plant species of greatest importance to climax plant association classification, is dominance. Dominance is "the collective size or bulk of the individuals of a group of organisms as it determines their relative influence on other components of the ecosystem" (Daubenmire 1978:313). Dominance is a measure of the quantity ("size or bulk") of a plant species that is present in a stand or site. Dominance is important because it describes that species' relative role in the ecosystem.

A plant species that is highly dominant not only affects its micro-environment (its micro-habitat or stand environment) significantly, but also is significantly affected by its micro-environment and its macro-environment (the regional climate and landform to which it belongs). The concept of dominance is important because it allows plant species to be used as relative indicators of their environment, a foundation of the habitat-type classification method. "The [plant] community is a more reliable indicator than any single species of it" (Clements 1920).

Plants respond to favorable environments by becoming more abundant, and to unfavorable environments by becoming less abundant or by not occurring there at all. Every plant species and subspecies has a different 'favorable environment', and observations about where a plant species seems to grow best are the best source for the indicator value of that species. Although descriptions of indicators are valuable as aids, the user must to a great extent discover indicator relationships. After some observations, it becomes apparent that each species occupies a more or less distinct habitat, but these are fairly broad in some cases, with a good deal of overlap. Somewhat more definition comes into the picture when you consider only the portion of a species' range over which it has the highest cover.

The habitat type method refines this picture of species patterns in space, by considering combinations of two to four species taken in sets, with the goal of partitioning the landscape into repeating units, each of which is characterized by a unique combination of species in association. With the addition of the time dimension, then all sites (stands) can be assigned to a place in the classification framework and the framework is complete (Daubenmire 1976, 1980).

Daubenmire (1968) surveyed the various measures of species within plant communities, and found that canopy cover is the best way to measure dominance. Canopy cover is "the most important single parameter of a species in its community relations" (Lindsey 1956, quoted in Daubenmire 1959). Canopy cover is "the percentage of the ground included in a vertical projection of imaginary polygons drawn about the total natural spread of foliage of the individuals of a species" (Daubenmire 1968: 43). "A two-dimensional estimate of that part of space over which a plant [species] exerts its influence is best approximated by a polygon described about the periphery of the undisturbed canopy" (Daubenmire 1959). Canopy cover applies to all plant species, whether large or small, woody or herbaceous, and also applies to plants and other characteristics at the soil surface, such as moss and lichen cover, litter cover, bare soil cover, gravel cover, and rock cover.

7. Succession

Stands (sites) within a habitat type delineation are different because they have different histories, especially different histories of disturbance. If a stand (site) remains undisturbed, then it is said to be at the climax stage. Disturbance can occur by the actions of mankind such as timber harvest, grazing, road building, or plowing; or by natural disturbances such as fire, insects, diseases, earthquakes, glaciers, or large storms. The climax stage is "a self-perpetuating state so long as present climatic, edaphic, and biotic conditions continue... [It is] attained when population structures of all its species fluctuate rather than exhibit unidirectional change" (Daubenmire 1978:313). Classification of plant communities begins by finding such undisturbed stands (sites), sampling them, and grouping them into natural units called plant associations (Clements 1934).

Climax is primarily the final, self-perpetuating stage in succession (Clements 1936). Climax is also, more importantly, a concept that allows "the most significant [stratification] of the land surface" (Daubenmire 1952). The Forest Service, as most land and resource management agencies, rarely manages to perpetuate climax conditions. The stands (sites) that remain at climax are important because they make it possible for us to erect a framework within which we can effectively describe potentials and predict responses, and they make it possible to stratify the land base into units with closely similar potentials and responses.

In recent years, the term potential natural community (PNC) has been coined to replace the term "climax." They are both self-perpetuating plant communities at the end of succession, but PNC is the endpoint of succession given that past disturbance has occurred (FSH 2090.11). In most sites, PNC will be the same as climax, but they will differ in sites where past disturbance has significantly altered the site potential, for example plowed fields. The substitution of the term "PNC" for the term "climax" may eventually lead to degradation of some sites, as has happened in countries where long-term heavy grazing pressure has permanently changed site potential, as in the Mediterranean Basin. The term "climax" should be retained at least as a concept, since it must continue to be the basis for the most-significant stratification of the land base. PNC should be described in addition for those sites where it differs from climax.

Climax is the last in a series of sequential steps that plant communities pass through following disturbance. These steps are called seral stages, and the whole sequence is called a sere (Clements 1916). Very often, especially in forests, only the stages earlier than climax are called seral, whereas in fact "climax" is itself a seral stage. The term "seral" is also applied to compare plant species, for example, "ponderosa pine is seral to Douglas-fir in Pig/Libo plant association." It is important to realize that such statements must always be qualified, because they are only true in one plant association, and therefore only in certain stands.

Each plant association has a distinctive sequence of seral stages. The plant association is the largest unit of vegetation within which it is possible to effectively model succession. This is one of the reasons why larger units of vegetation are not very useful in resource classification and inventory. Within a plant association, the seral stages are often represented in a linear (one-dimensional) ordering (Fig. 2).

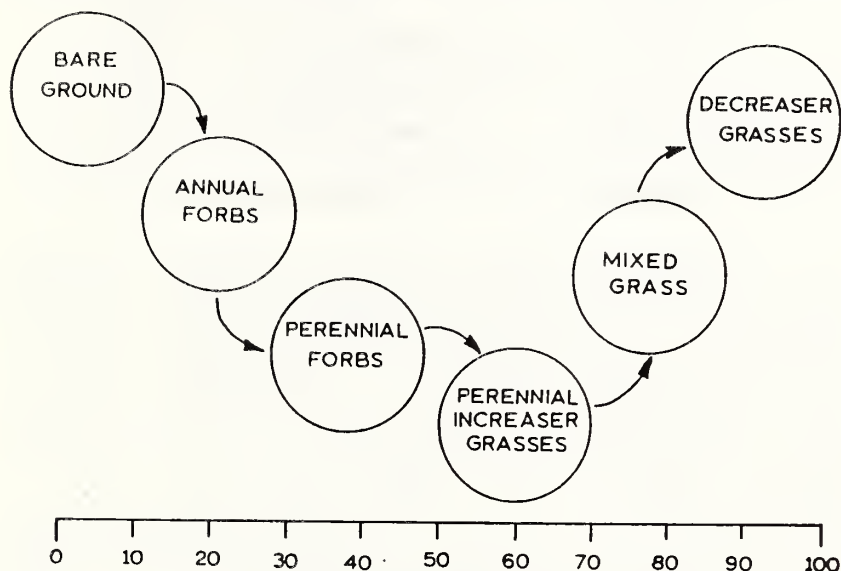


Figure 2. Simplification and reduction to one dimension of an idealized sere. Boxes each represent one generalized seral stage; numbers along the bottom show percentage of present community as compared with climax (the seral score).

This linear ordering is a severe distortion of the true stages of succession. In fact, there are very many different plant communities within each climax plant association, because the present plant community at each stand (site) is a result of the nature of past disturbances, the intensity of those disturbances, and the time since the disturbances occurred. The number of permutations of disturbances, intensity, and timing is very, very large. In fact, this large number of present plant communities is the very reason why classification using climax is necessary. "Seral communities are not well organized" (Daubenmire 1952). The true ordering of plant communities within a plant association is multidimensional, multifactorial, and reticulate (Huschle and Hironaka 1980).

Some major principles of succession that may prove useful:

a. Shade-tolerance relationships of tree species. If two tree species are both reproducing on the same stand, adequately to replace the stand, then the one that is more shade-tolerant will eventually dominate the stand. This principle does not apply everywhere,

however: if the site is rocky or dry and hot, shade-tolerance will not be as important. In those cases, the species that are best adapted to the site will dominate.

b. Some forest associations will have a closed canopy at climax. Others will have a canopy that opens up as they approach climax.

c. In an earlier-seral stand, take some time to find the best-shaded spots in the stand, especially those under the canopies of the tree species that will eventually dominate the climax stand (these may only be seedlings or saplings).

d. For the herbaceous and shrub species on the site, an indication of successional trends begins with noting whether a species is an increaser, decreaser, or invader, in response to the land-use or management activities that may have occurred on your site. For example Idaho fescue (*Festuca idahoensis*) is known to be highly palatable to cattle on most mountain ranges in this Region. If your site has Idaho fescue only relictual within the site ("hiding in the bushes"), you can hypothesize that there has been moderate to heavy cattle grazing some time in the past (other indicators may show approximately how long it has been since, and whether the site is recovering). Idaho fescue is then said to be a decreaser on that site; there must have been more of it at climax. If your hypothesis as to past use is correct, then Idaho fescue may have been in enough quantity to be a dominant at climax. The plant association descriptions can aid in this; for example, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is an increaser in serviceberry (*Amelanchier*) plant associations.

e. Bear in mind that no species is an indicator of climax everywhere it occurs; and no species is an indicator of early seral conditions wherever it occurs.

The linear ordering of seral stages (Fig. 2) is necessary to simplify the extremely complex true picture. Description of all the plant communities within a plant association is an important task, but will take a long time. The axis on which the seral stages appear in Figure 2 is usually quantified into 100%, where 0% is the earliest stage in (secondary) succession, that is, bare ground. 100% is assigned to the last stage, climax. Progress in the sere is measured by comparing the present plant community, as measured in canopy cover by species, with the climax community, to give a percentage, called the seral score. Adjectival ratings are then assigned to ranges of percentages:

Seral score	Seral stage-1	Seral stage-2
0-15%	Very early seral (VE)	= Very Early (V)
15-30%	Early Seral (ES)	} = Early (E)
30-40%	Early Midseral (EM)	
40-60%	Midseral (MS)	= Midseral (M)
60-70%	Late (upper) Midseral (LM)	} = Late (L)
70-85%	Late Seral (LS)	
85-100%	Climax (PN)	= Climax (P)

In this table, "Seral score" is a 100-class grouping, "Seral stage-1" is a seven-class grouping, and "Seral stage-2" is a five-class grouping. Data base codes (RIS) for the stages are given in parenthesis. The user should select the coding (percentage,

seven-step, or five-step) that best reflects his/her inventory and needs. Several scorecards have been developed for plant associations in this Region by which an inventory crew can interpret seral stages. Presentation and discussion of these scorecards will be made the subject of a separate field guide.

8. Vegetation classification hierarchy

The plant association is the fundamental unit in the vegetation classification (taxonomic) hierarchy. The habitat type occupies a similar position as the fundamental unit in the land unit (map unit) hierarchy. Larger units, higher in the hierarchies, are more difficult to define. Many workers have proposed different hierarchical schemes, no one of which is evidently better than others.

Daubenmire (1952, 1968, 1978) defined his vegetation hierarchies as follows:

<u>Taxonomic Units</u>	<u>Land Units</u>
Plant Association	Habitat Type
Plant Series	Vegetation Zone
	Vegetation Section
	Vegetation Province
	Vegetation Region

Plant Series is a group of plant associations with common primary climax dominants. For example, all the plant associations that have ponderosa pine dominant at climax are grouped into the *Pinus ponderosa* series; all the plant associations that have Thurber fescue dominant at climax are grouped into the *Festuca thurberi* series. The plant associations all nest into plant series, that is, each association fits into only one series, but the land units are not nested. Each habitat type does not fit into only one zone. Also, the zone is not the map equivalent of series.

In the "Ecological Land Classification Framework" (Driscoll et al. 1984), the vegetation hierarchy includes only taxonomic units:

<u>Taxonomic Units</u>
[Plant] Association
[Plant] Series
[Plant] Formation
[Plant] Group
[Plant] Subclass
[Plant] Class

In this system, units of the vegetation hierarchy are to be combined with units of the soil, water, and/or landform hierarchies to define map units. Therefore, the taxonomic units are for the most part nested, but the map units may not be, because map units are integrated among several components, at one level only.

In this book, the lower portion of the vegetation hierarchy in the "Ecological Land Classification Framework" of Driscoll et al. (1984) has been adopted with modifications. Appendix 5 shows a first attempt at grouping plant associations into higher vegetation units along logical grounds. This grouping is completely nested, that is, each plant association appears only once in the list.

In Appendix 5, the Arabic numerals (01, 02, etc.) are approximately at the level of Formation of Driscoll et al., and the capital letters (A, B, etc.) would then be Subformations, appearing between Formation and Series in Driscoll et al. Plant Series have mostly been split into different Subformations, although there are exceptions where a whole Series fits into one Subformation.

Subformations approximate the "Potential Natural Vegetation" units of Kùchler (1964), but it must be emphasized that the descriptions of Kùchler's units were used, rather than and of the maps available. Habitat types do not nest into Kùchler's map units.

9. Names for plant associations and habitat types

A habitat type is named for the single plant association that represents its potential. A plant association is named for the species that dominate it at climax, insofar as possible. However, sometimes other, non-dominant species must be chosen in order to effectively distinguish a plant association from related ones. Some examples follow:

1. *Abies lasiocarpa*/*Carex geyeri* plant association (p.a.)
2. *Abies lasiocarpa*-*Picea englemannii*/*Carex geyeri* p.a.
3. *Abies lasiocarpa*-*Picea englemannii*/*Vaccinium scoparium* p.a.,
phase *Carex geyeri*
4. *Festuca idahoensis*/*Geranium viscosissimum* p.a.
5. *Artemisia tridentata*/*Festuca idahoensis* p.a.
6. *Purshia tridentata*-*Artemisia tridentata*/*Festuca idahoensis* p.a.

Often only two species appear in the name, separated by a slash ("/"). In some cases, however (examples 2, 3, 6), more than two names is necessary to be able to distinguish related plant associations. Many workers call example 2 "*Abies lasiocarpa*/*Carex geyeri*," but that becomes unworkable after discovery of stands in which *Picea englemannii* is not potential (1). Spruce must be added to the name to distinguish it from example 1. Example 3 differs from the first two by conspicuous *Vaccinium* in a lower layer. Similarly, bitterbrush must be added to the name in example 6 to distinguish it from the very different plant association of example 5.

Originally, the slash in the name reflected a canopy (layer) difference between the species it separated. As more and more herbaceous communities were described, it became desirable to include the slash in the name in any case, even if the species separated by the slash belonged to the same layer, as in example 4. In the present system, the slash does not connote any layer distinctions, but simply means that a name with a slash is a climax community or its map unit.

The names of plant associations correctly use the scientific names of the species. There are three other versions of the same name that are used in this Region, all of which are made equivalent using the summary in Appendix 1.

The goals of nomenclature are to:

- a. Name plant associations for plant species that are present in every stand, that is, have 100% constancy, at climax. Failing that, use plant species that are more constant than others.
- b. Name plant associations to facilitate their identification.
- c. Name plant associations for plant species that are the most dominant, that is, have greater canopy cover than any other species. If a choice must be made between two species, one with high constancy and one with high cover, choose the one with high constancy. Constancy relates to ease of identification, whereas cover relates to dominance.
- d. Name plant associations so that different plant associations can be distinguished from one another. Names should be binomial (including two species only) if possible. In some cases, a third name should be added to make two different associations distinguishable.

Sometimes, plant association names must include two (or more) species that are codominant or that replace one another. Examples:

7. *Salix geyeriana*-*Salix* spp./*Calamagrostis canadensis* p.a.
8. *Juniperus osteosperma*-*Pinus edulis*/*Roegneria spicata* p.a.
9. *Bouteloua gracilis*/*Stipa* spp. p.a.

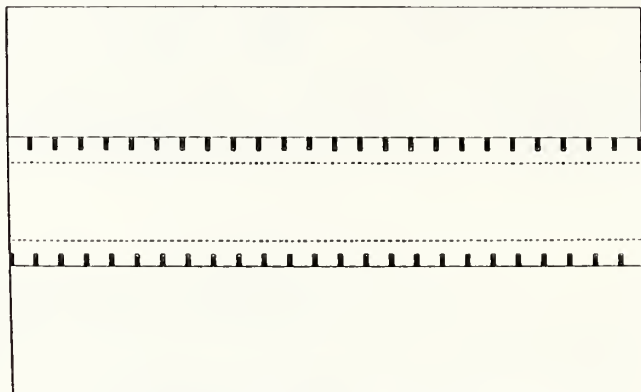
In example 7, *Salix geyeriana* is always present, and there are always other *Salix* species present as well, but there are several other species involved; in most sites, there are at least three *Salix* species present. In example 8, *Juniperus osteosperma* and *Pinus edulis* are codominant, that is, they occur in about the same abundance and do not replace each other. In example 9, there are several *Stipa* species possible, but only one species dominates in each site. The different *Stipa* species are said to replace one another.

10. Classification and inventory

Classification of plant associations consists of finding and sampling stands (sites) at climax or near-climax, and grouping them into natural units with homogeneity of plant species and environment (Daubenmire 1952, Pfister and Arno 1980). So classification includes sampling of selected stands (sites) only. Inventory, in contrast, usually includes samples from all stands or sites within a geographical area, often a Ranger District, National Forest, or National Grassland. Inventory of plant associations must be preceded by classification, because the task of inventory in this connection is to identify the (climax) plant association to which a site or stand should be assigned. Inventory often includes mapping of habitat types, but delineation of map units is never part of classification.

There are several methods in use to classify plant associations (or habitat types). The methods for classification are obviously much more complex and time-consuming than inventory methods.

The historical standard method for classification is Daubenmire's original method, used by Daubenmire himself and several of his students (e.g., George Hoffman, see the main bibliography). In this method (Daubenmire 1968, for example), a 15 m x 25 m rectangle (macroplot) is laid out on the ground, with the long axis usually parallel to the contour. The short axis is divided into three 5 m strips, and along the long sides of the middle strip a number (50, more or less) of smaller 20 cm x 50 cm microplots are regularly arranged (Fig 3).



A system of nested plots that has proved satisfactory in sampling coniferous forests in western North America. All trees >1 m tall are counted and recorded by D.B.H. (in decimeters) classes to determine population structure (see Table 18), using all three of the contiguous macroplots, each 5 x 25 m. Trees < 1 m tall are counted in two strips 1 m wide along the sides of the central macroplot. Coverage of shrubs, herbs, and macroscopic cryptogams is tallied in plots 20 x 50 cm at meter intervals along the sides of the central macroplot. Other species, too rare to be encountered in the sampling system, are also listed. If the total area is homogeneous, a soil profile study made at the center should be reasonably representative of the entire set of data.

Figure 3. The original method of Daubenmire. The large rectangle outlined is 15 m x 25 m. There are 50 microplots. The figure and caption are from Daubenmire (1968:87).

Canopy cover is estimated by species on each of the microplots, with the eye aided by paint marks on the microplot frame (Fig. 4), and average canopy cover is calculated by species for the whole macroplot, using the midpoints of the canopy-cover classes. By counting the number of times a species occurs in a microplot, frequency can also be extracted.

The method can be applied just as well in forests, grasslands, or shrublands. It is, however, very time-consuming, and usually does not give canopy cover by tree species, which is needed for wildlife modeling. Further details on the method, and some minor variations, can be found in Daubenmire (1962, 1968, 1970), Hess and Wasser (1982), and Hoffman and Alexander (1976, 1980, 1983).

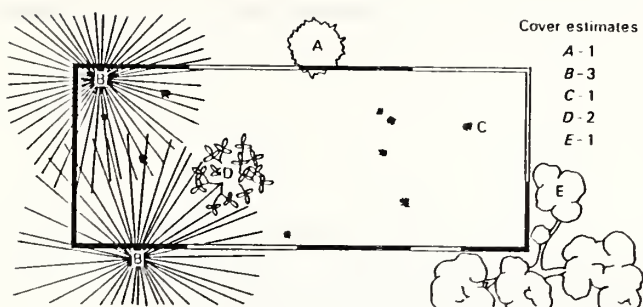


Diagram illustrating a method for estimating canopy coverage. The painted pattern on the 20 x 50 cm frame provides areas for visual comparison equal to 5, 25, 50, 75, and 95 percent of the frame. The biologic soundness of using a vertical projection of a polygon drawn about the extremities of the plant canopy is illustrated by E, which, by accident of foliage arrangement, has no leaves directly above the plot. Such a plant probably exerts at least as much influence on the 20 x 50 cm portion of an ecosystem as does A.

Figure 4. The microplot as used by Daubenmire. Notice the painted pattern on the frame, which guides the user's eyes to the limits of the canopy-cover classes. Canopy-cover classes are: 1 = 0-5%, 2 = 5-25%, 3 = 25-50%, 4 = 50-75%, 5 = 75-95%, 6 = 95-100%. Figure and caption from Daubenmire (1968: 43).

Daubenmire's original method is now little used for forests, having been supplanted by the modification of Pfister and Arno (1980). In the modification, the rectangular macroplot of 375 m² is replaced by a circular macroplot of the same area; the circular macroplot has a radius of 10.93 m (35.8 ft). No microplots are used, but instead canopy cover is estimated by species on the whole macroplot, including all species (trees, shrubs, herbaceous). Most workers have found that Daubenmire's original method with microplots must be used fairly often (about 1:20) to keep the field crew's estimation of canopy cover accurate (Moir and Ludwig 1983).

The circular modification of Pfister and Arno (1980) is most often used in closed-canopy forests; it works less well in forests with grassy understories, and poorly in grasslands or shrublands. The difficulty is that it is hard to see canopy cover by species of mixed grasses or shrubs when those layers total more than about 40%. Frequency is not obtainable, but frequency data is not as often used as canopy cover and constancy. On the other hand, the circular modification is apparently just as accurate as Daubenmire's original method as long as care is taken to keep the field crew's estimation of canopy accurate. The circular modification takes much less time to sample, leaving more time to better sample other characteristics (soils for example) or more stands.

I have designed a further modification of the circular method of Pfister and Arno (1980) in order to extend application to all plant associations (forests, shrublands, grasslands, forblands) while keeping

sample time low. In this method, the circular macroplot of Pfister and Arno is retained, and divided into four equal quadrants (Fig. 5). Ten microplots of the usual size are scattered in a regular pattern in the macroplot. Canopy cover is estimated for all species on the ten microplots in the usual way, and thereafter canopy cover is estimated on each quadrant of the macroplot in a way similar to Pfister and Arno. The quadrants usually pick up trees, taller shrubs, and minor understory species that may not appear in the microplots. This way, some frequency data is made available, greater accuracy is given to the canopy cover estimation (through several replications), and the natural patchiness of communities is more easily accommodated. The ten microplots could also be used for clipping understory vegetation, since ten microplots add up to 1 m^2 .

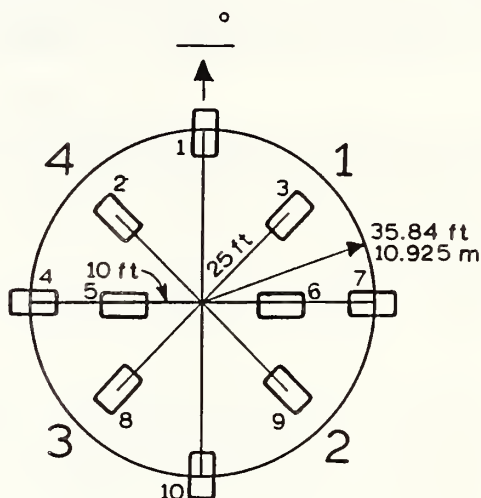


Figure 5. Modified plant association classification and inventory method, using ideas of Daubenmire (1952, 1968) and Pfister and Arno (1980). The small rectangles are the same size as in Fig. 4 or Fig. 6, to be read in the same way. See Fig. 6 for cover classes.

The microplot I use is of the same size as Daubenmire's (20 cm x 50 cm) but has different paint markings, since I use ten equal canopy cover classes (Fig. 6). Equal cover classes are easier to remember and teach, and also are subject to normal statistics.

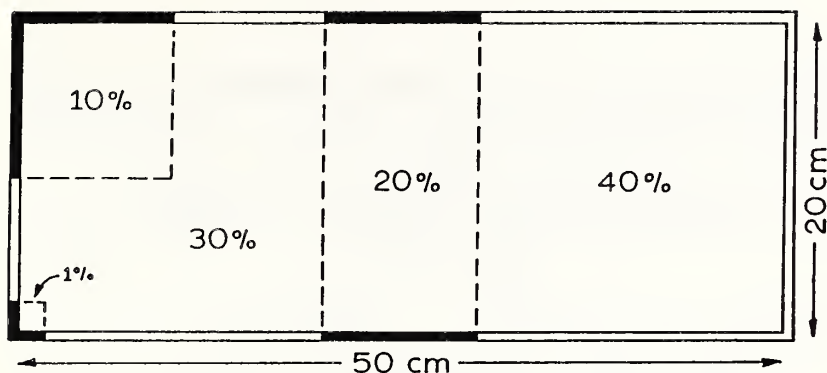


Figure 6. The microplot in the modified method, to be used in the pattern of either Fig. 5 or Fig. 7. Canopy cover to be estimated in the same manner as in Fig. 4 and Daubenmire (1952, 1959, 1968). Painted pattern is designed for ten cover classes: 0 = 1-10%, 1 = 10-20%, 2 = 20-30%, 3 = 30-40%, 4 = 40-50%, 5 = 50-60%, 6 = 60-70%, 7 = 70-80%, 8 = 80-90%, 9 = 90-100%. Another cover class, T = 0-1%, is used but not included in the calculation of average cover.

For inventory, one could use any of the three methods described previously, but the original Daubenmire method is much too time consuming. The Pfister and Arno circular-plot method, which applies poorly to grasslands and open forests; the modified circular plot (Fig. 5) works well in all communities. One inventory method that I have used in shrublands, grasslands, and forests is a 100 ft transect with the usual microplots regularly arranged along it, usually every 10 ft (Fig. 7). Canopy cover of taller shrubs and trees can be estimated for the whole area; a better way is to use the line-intercept method along the 100 ft transect (Canfield 1941). For trees, you could also use a spherical densiometer (Anon. 1985), or hold the microplot frame at arm's length above your head. The last method should include averaging at least five replications (at the sample points along the transect); it is a bit easier to estimating cover by species than line-intercept or the spherical densiometer.

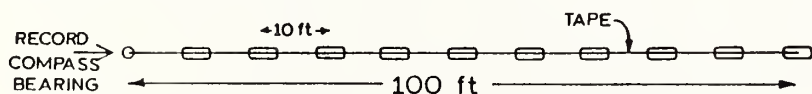


Figure 7. A transect method for use in rangeland inventories, or elsewhere where shrubby or herbaceous understories are important. The small rectangles are microplots as shown in Fig. 6. Tree cover is estimated by holding the microplot frame at arm's length above your head. Shrub cover is estimated using the line-intercept method along the tape.

How many microplots need to be placed along the transect? Ten seems to be the best number for all-purpose use, but five seems to be almost as good. The minor species are not as well-represented by five microplots, but the major ones are, which may be acceptable to meet inventory goals. Another reduction in time can be taken by only estimating cover on the 10 to 15 species that lead in cover in the community; this list must be prepared before sampling begins.

Special consideration must be given to sampling in riparian areas, because they are often narrow and diverse in structure and number of species. Even though they may occupy a small percentage of the land area, they are important very much more than their acreage would indicate. In sampling riparian areas, any of the four methods described previously would work to some extent, but you will need to choose a method that applies to the plant community at hand. For example, application of the original Daubenmire method to a thicket of willows eight feet tall would not go very well. One of the circular-plot methods seem to have the most consistent applicability here.

The method I recommend in riparian areas begins by delineating the riparian site using the outer edges of the distinctive riparian vegetation (using the list of riparian plant associations in Appendix 6), and the stream reach breaks defined using the criteria in Rosgen (1985). Divide the stream reach into five-to-ten segments using lines perpendicular to the stream (Fig. 8), and estimate canopy cover by species in each segment using a plotless method similar to the circular macroplot of Pfister and Arno (1980). If appropriate, a transect can be added with microplots along it, and this should be wholly in the riparian, not crossing the stream, if possible.

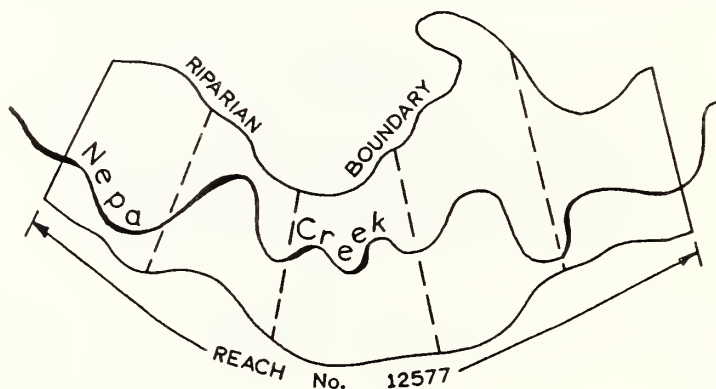


Figure 8. A typical stream riparian area, divided into five segments for sampling. Canopy cover by species is estimated on each segment.

Specific details and scorecards for evaluating riparian areas will be presented in a separate field guide.

11. Stratification and mapping

Before beginning to sample a stand (site) for classification or inventory, the user should make sure the site (stand) has been delineated, that is, drawn on a map. This could be done using photointerpretation or other methods. The goal is to have a site (stand) that is fairly homogeneous in vegetation and site descriptors. Before sampling, the user should try to find a place within the stand which is better representative of the stand, away from any ecotones. In most forests, that often means the area of greatest tall canopy; in grasslands, that often means the greatest cover by climax-dominant species.

In some other Regions, and for some areas within this Region, an effort has been made to map habitat types. This is obviously a very useful effort, because such maps facilitate application of known potentials and responses to aid in making resource management decisions. The greatest usefulness is attained when the mapping of habitat types is combined with all inventory efforts. Then the resource manager has before him/her in one map information about potentials and responses (habitat types) as well as stand (site) inventory data. The great need is for both identification of habitat types and collection of current resource condition and status at the same time. For this reason, the Rocky Mountain Region has been encouraging the identification of plant associations incorporated into all map-based resource inventories. It is hoped that books such as this one, and field guides based on it, will be of help in this effort.

12. Authorities for plant species names

In general, the floras listed below for the five states of this Region have been continuously referred to as authorities for the existence and circumscription of plant species found within their respective states. The floras cited are fairly uniform in these respects, since most of them follow standard monographs and revisions of plant groups. However, there is quite a bit of variation among the floras cited as to their approaches to species nomenclature. Unification of species nomenclature follows the work of the leading plant taxonomist of the Region, William A. Weber (1976, 1979, 1987). In each case an attempt was made to choose the name that followed the most recently accepted taxonomic work. The results are shown in the complete species list in Appendix 2.

Wyoming. DORN, R. D. 1977. Manual of the vascular plants of Wyoming. Garland Publishing, New York, 2 vols., 1498 pp.

South Dakota. VAN BRUGGEN, T. 1985. The vascular plants of South Dakota, 2nd edition. Iowa State Univ., Ames, 476 pp.

Nebraska and Kansas. MCGREGOR, R. L., T. M. BARKLEY, R. E. BROOKS, E. K. SCHOFIELD, and 14 other authors. 1986. Flora of the Great Plains. Univ. Press Kansas, Lawrence, 1392 pp. (Secondary authority for SD).

Colorado. WEBER, W. A. 1987. Colorado flora: Western slope. Colorado Assoc. Univ. Press, Boulder, approx. 550 pp. (To appear about July 1987, draft copies have been available since 1985).

WEBER, W. A., and B. C. JOHNSTON. 1979. Natural history inventory of Colorado: 1. Vascular plants, lichens, and bryophytes, 2nd edition. Univ. Colorado Museum, Boulder, 220 pp.

WEBER, W. A. 1976. Rocky Mountain Flora, 5th edition. Colorado Assoc. Univ. Press, Boulder, 479 pp.

13. Literature cited in this chapter

ANONYMOUS. 1985. The spherical densiometer revisited. Southwest Habitat 6(2), 2 pp. USDA Forest Service, Southwestern Region, Albuquerque NM.

BAILEY, R. G. 1980. Description of the ecoregions of the United States. USDA Forest Service Misc. Publ. 1391, 77 pp. + 1 map.

CANFIELD, R. H. 1941. Application of the line intercept method in sampling range vegetation. J. Forestry 39:388-394.

CLEMENTS, F. E. 1916. Plant succession: An analysis of the development of vegetation. Carnegie Inst. Washington Publ. 242, 512 pp.

CLEMENTS, F. E. 1920. Plant indicators: The relation of plant communities to process and practice. Carnegie Inst. Wash. Publ. 290, 388 pp.

CLEMENTS, F. E. 1934. The relict method in dynamic ecology. J. Ecology 22(1):39-68.

CLEMENTS, F. E. 1936. Nature and structure of the climax. J. Ecology 24(1):252-284.

DAUBENMIRE, R. 1952. Forest vegetation of northern Idaho and adjacent Washington, and its bearing on concepts of vegetation classification. Ecol. Monogr. 22(4):301-330.

DAUBENMIRE, R. 1959. A canopy-coverage method of vegetational analysis. Northwest Sci. 33(1):43-64.

DAUBENMIRE, R. 1968. Plant communities: A textbook of plant synecology. Harper and Row, New York, 300 pp.

DAUBENMIRE, R. 1970. Steppe vegetation of Washington. Washington Agric. Expt. Sta. Tech. Bull. 62, 112 pp.

DAUBENMIRE, R. 1973. A comparison of approaches to the mapping of forest land for intensive management. Forestry Chron. (April):87-91.

DAUBENMIRE, R. 1976. The use of vegetation in assessing the productivity of forest lands. Bot. Rev. 42(2):115-143.

DAUBENMIRE, R. 1978. Plant geography, with special reference to North America. Academic, New York, 338 pp.

DAUBENMIRE, R. 1980. The scientific basis for a classification system in land-use allocation. In The scientific and technical basis for land classification. Society of American Foresters, Spokane, Washington, pp. 7-10.

DAUBENMIRE, R., and J. B. DAUBENMIRE. 1968. Forest vegetation of eastern Washington and northern Idaho. Washington Agric. Expt. Sta. Tech. Bull. 60, 104 pp.

DRISCOLL, R. S., D. L. MERKEL, D. L. RADLOFF, D. E. SNYDER, and J. S. HAGIHARA. 1984. An ecological land classification framework for the United States. USDA Forest Service Misc. Publ. 1439, 56 pp.

DYKSTERHUIS, E. J. 1958. Ecological principles in range evaluation. Bot. Rev. 24(4):253-272.

DYKSTERHUIS, E. J. 1958. Range conservation as based on sites and condition classes. J. Soil Water Conserv. 13(4):151-155.

EYRE, F. H., ed. 1980. Forest cover types of the United States and Canada. Society of American Foresters, Washington DC, 148 pp. + map.

HUSCHLE, G., and M. HIRONAKA. 1980. Classification and ordination of seral plant communities. *J. Range Manage.* 33(3):179-182.

KUCHLER, A. W. 1964. Manual to accompany the map, potential natural vegetation of the conterminous United States. *Amer. Geogr. Soc. Special Publ.* 36, 39 + 116 pp.

LINDSEY, A. A. 1956. Sampling methods and community attributes in forest ecology. *For. Sci.* 2:287-296 (cited in Daubenmire 1959).

MOIR, W. H., and J. A. LUDWIG. 1983. Methods of forest habitat type classification. In MOIR, W. H., and L. HENDZEL, eds. *Proceedings of the workshop on southwestern habitat types.* USDA Forest Service Southwestern Region, Albuquerque NM, pp. 5-10.

PFISTER, R. D., and S. F. ARNO. 1980. Classifying forest habitat types based on potential climax vegetation. *For. Sci.* 26(1):52-70.

SOIL SURVEY STAFF. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. *USDA Agric. Handb.* 436, 754 pp.

USDA SOIL CONSERVATION SERVICE. 19XX. National range handbook.

WERTZ, W. A., and J. F. ARNOLD. 1972. Land systems inventory. *USDA Forest Service Intermountain Region, Ogden UT*, 12 pp.

TABULAR KEYS TO THE PLANT ASSOCIATIONS
OF THE NATIONAL FORESTS AND NATIONAL GRASSLANDS
OF THE ROCKY MOUNTAIN REGION (REGION TWO)

How the keys are organized

There follow fifteen foldout keys, one for each administrative National Forest in the Rocky Mountain Region. For those National Forests who administer one or more National Grasslands, a separate key has been prepared for those National Grasslands; except for the Nebraska National Forest, which all appears in one table. The keys are in order from west to east, beginning from the north and working south, with related National Forests close together where possible. The keys are:

- + 1. Shoshone National Forest, Wyoming
- * 2. Bighorn National Forest, Wyoming
- * 3. Black Hills National Forest, South Dakota and Wyoming
- ** 4A. Medicine Bow National Forest, Wyoming
- ** 4B. Thunder Basin National Grassland, Wyoming
- * 5. Nebraska National Forest, South Dakota and Nebraska (including Samuel R. McKelvie National Forest, Buffalo Gap National Grassland, Fort Pierre National Grassland, and Oglala National Grassland)
- + 6A. Arapaho and Roosevelt National Forests, Colorado
- ** 6B. Pawnee National Grassland, Colorado
- * 7. Routt National Forest, Colorado
- + 8. White River National Forest, Colorado
- * 9. Grand Mesa, Uncompahgre, and Gunnison National Forests, Colorado
- *10. San Juan National Forest, Colorado
- *11. Rio Grande National Forest, Colorado
- *12A. Pike and San Isabel National Forests, Colorado
- **12B. Comanche and Cimarron National Grasslands, Colorado and Kansas

Each key is a stratified list of the plant associations of each National Forest or Grassland, extracted from the text of this book. Each table is in two parts: the first part, which lists the plant associations documented or reliably reported from that National Forest or Grassland; and the second part, listing those from adjoining areas that are expected to occur there. The second part of each table is particularly important for those Forests or Grasslands for which a complete classification has not yet been finished (** = not begun; * = part (usually commercial forests) done; + = all done).

In the tables for National Forests, plant associations are listed in "top-down" order, that is, proceeding from the highest elevations to the lowest. You will notice that the maximum elevation for each plant association was used, rather than the minimum. This means that not all plant associations occurring in adjacent stands (sites) will appear in adjacent lines in the table, since some associations have broad elevational ranges, and some narrow. In cases where two plant associations have the same elevational range, the one on the higher-slope position is listed first. A line has been drawn across the page, indicating the approximate position of the alpine-subalpine ecotone (upper treelimit), in those cases where a Forest or Grassland gets that high. Lower treelimit has not been shown, because it is not apparent in tables of this type (it would be apparent in a "bottom-up" table).

In the tables for National Grasslands, plant associations are listed in rough order from cool-moist to warm-dry, and are grouped by dominant growth-form (that is, shrublands together, grasslands together, etc.).

In each table, there are separate columns for forests (whether coniferous, deciduous, or woodland), shrubland, grassland and forbland, and riparian. The riparian column includes all riparian plant associations, whether coniferous forest, deciduous forest, shrubland, grassland, or forbland (there are no riparian woodlands). The page number carries a letter prefix indicating the dominant growth-form, and therefore indicating the colored section of the text where the reader will find a description, using the codes in Appendix 1:

- C. Coniferous forests (green)
- D. Deciduous forests (blue)
- W. Woodlands (white)
- S. Shrublands (yellow)
- G. Grasslands (green)
- F. Forblands (blue)

The elevation for each plant association on that National Forest or Grassland is given, rounded to the outside, in hundreds of feet. For example, "77-110" takes the place of "7,760-10,930 ft." Elevations shown in parenthesis, for example "(54-75)", have been extrapolated from adjacent areas.

Distinguishing features are shown, mainly features of soil, landform, or water. In general, commas have not been used except where absolutely necessary; a hyphen has been added to attach adjectives to the noun they modify. Words unconnected by a hyphen (and groups of words connected by a hyphen) all modify the plant association or its site. In the example, "dry cold open-canopy grassy," the words "dry," "cold," and "grassy" all describe the plant association itself; the word "open" describes the canopy, hence the hyphen. Abbreviations have been necessary to keep each plant association to one line. Some more common abbreviations:

- c.c. Climatic climax association.
- mod. moderately- or moderate
- ph. phase (of a plant association)
- rel. relatively-
- SL, CL, SIC Sandy-loam, clay-loam, silty-clay, etc., soil textures in the upper (rooting) horizons, usually A horizon(s)
- v. very-

Other abbreviations should be readily apparent from the context. For many words, it has not been possible to include the nouns they modify; the user will have to use some imagination. "Deep" "shallow" "rocky" all describe the soil, for example. "Gentle" implies a small slope angle.

Adjectives describing a plant association (and/or its site) are all to be taken as relative to that plant series. For example, a description of Abia-Pienl/Cagel (subalpine fir-Engelmann spruce/elk sedge p.a.) as "cool lower-elevations deep" is cool, at lower elevations, and has deep soils for the spruce-fir series, not necessarily for the whole Forest.

How to use the tabular keys

1. Select the key for the Forest or Grassland where you are. If you are not on a Forest or Grassland, choose the closest one in distance, or the most closely related in plant communities.

2. Before using these keys, the user should make sure the sites (stands) have been delineated, that is, drawn on a map. This could be done using photointerpretation or other methods. The goal is to have sites (stands) that are fairly homogeneous in vegetation and site descriptors. In addition, the user should try to find a place within the stand which is better representative of the stand. In most forests, that often means the area of greatest tall canopy; in grasslands, that often means the greatest cover by climax-dominant species. In an ideal case, a standard 375 m² plot should be set up, with or without 20 x 50 cm microplots, and canopy cover recorded (ocular estimate) by all plant species (forms R-2 2060-2 or 2060-2A). A beginner should do this a few times, in order to get a good foundation in the use of canopy cover as the best way to quickly estimate the quantity of each species present. After getting this exercise behind him/her, the user can simplify the procedure to simply estimating canopy cover of the few (5-10) leading species, in a plotless way. In the keys and descriptions in this book, canopy cover by species (Daubenmire 1959) is the basis for comparison of those plant species.

3. Move down the key, excluding associations, sites, or elevational ranges, until you arrive at the rough elevational range of site where you are. As you move down the key, you will want to take note of plant associations having a lower-elevation that includes your site, or that you might expect because of similar site conditions. Bear in mind that for many Forests and Grasslands, the complete elevational range is unknown. Elevations shown in the table are those that appear in the records that are available, and are undoubtedly incomplete.

4. Sort associations in your elevational range, and exclude those that are very different from your site in physical characters or vegetation. When this process has pared the list down to several or a few, read the descriptions of vegetation and site in the text (colored pages) to resolve the differences and arrive at the correct identification of the plant association of your site.

5. Your answer does not become final until you have confirmed the vegetation and site as being essentially similar to the descriptions in the text (colored pages). In addition, you may wish to consult some of the literature references cited, especially those from your Forest or Grassland.

6. In using the vegetation descriptions, you must consider that these keys have been written for use in climax or near-climax stands, because "seral communities are not well organized" (Daubenmire 1952). This means that in stands at earlier seral stages it will be necessary for the user to use principles of succession to project the stand forward in time to climax or near-climax. Some major principles of succession that may prove useful:

a. Shade-tolerance relationships of tree species. If two tree species are both reproducing on the same stand, adequately to replace the stand, then the one that is more shade-tolerant will eventually

dominate the stand. This principle does not apply everywhere, however: if the site is rocky or dry and hot, shade-tolerance will not be as important. In those cases, the species that are best adapted to the site will dominate.

b. Some forest associations will have a closed canopy at climax. Others will have a canopy that opens up as they approach climax.

c. In an earlier-seral stand, take some time to find the best-shaded spots in the stand, especially those under the canopies of the tree species that will eventually dominate the climax stand (these may only be seedlings or saplings).

d. For the herbaceous and shrub species on the site, an indication of successional trends begins with noting whether a species is an increaser, decreaser, or invader, in response to the land-use or management activities that may have occurred on your site. For example Idaho fescue (*Festuca idahoensis*) is known to be highly palatable to cattle on most mountain ranges in this Region. If your site has Idaho fescue only relictual within the site ("hiding in the bushes"), you can hypothesize that there has been moderate to heavy cattle grazing some time in the past (other indicators may show approximately how long it has been since, and whether the site is recovering). Idaho fescue is then said to be a decreaser on that site; there must have been more of it at climax. If your hypothesis as to past use is correct, then Idaho fescue may have been in enough quantity to be a dominant at climax. The plant association descriptions can aid in this; for example, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is an increaser in serviceberry (*Amelanchier*) plant associations.

e. Bear in mind that no species is an indicator of climax everywhere it occurs; and no species is an indicator of early seral conditions wherever it occurs.

7. After some experience in using the keys, a user will find he/she no longer needs to begin at the top each time, but can skip down to the appropriate place in the keys below.

8. After using the keys, and arriving at a plant association or two at the end, the descriptions should always be consulted. "The key is not the classification" (Pfister et al. 1977). A comparative method is helpful here: compare two or more related associations for characters that seem to be diagnostic.

9. Descriptors such as elevation, slope angle, soil types, and distribution by National Forest, are based on the best available data from sample plots and observations. However, these descriptors are probably not the final answers, and should not be strictly interpreted. We expect ranges to be extended. For example, we expect an association to be found slightly outside the elevation limits listed for it; or an association may be found on a National Forest or National Grassland other than the ones listed here. For those reasons, also consult the second part of each key, for plant associations expected but not yet confirmed. If that fails, see the tables for adjacent or related National Forests or Grasslands. For example, users on the Routt National Forest will wish to look at the tables for the Arapaho-Roosevelt or the White River.

KEY TO THE PLANT ASSOCIATIONS OF THE SHOSHONE NATIONAL FOREST, WYOMING
(Please see instructions at beginning of keys for explanation of how to use this key)

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	Elev.	Distinguishing Features
		Acro/Trda		F2	109-110	Coarse windy shallow
		Acro/Trna		F2	103-110	Steep windy shallow stony
		Acro/TRIF-Dece		F3	103-107	Steep rocky solifluction snow-accumulation protected
		Phsi/Trda		F9	105-106	Mod.-steep protected rocky mod.-deep
			Casc2/moss	G27	103-105	Wet solifluction terraces
			Casc2/Dece	G27	102-105	Moist alpine meadows & solifluction terraces
		Dece/Acro		G31	100-105	Gentle lower slopes, mod.-deep loamy, protected
		Trna/Libi		F18	103-104	Windswept ridges exposed thin well-drained
		Acro/Caru		F1	103-104	Gentle upper-slopes gravelly thin
		Trpa/Dece		F20	100-105	High meadows and turfs rocky gentle
		Komy/Acro-Caru		G50	-	"Grass"land mod.deep well-drained gentle <u>c.c.</u>
		Caru/Phsi		G25	103-104	High ridgetops, wind-exposed
			Casc2/Acro	G26	100-105	Level hummocks, hollows, & solifluction terraces
			Can1/JUNC	G22	100-105	Alpine depressions, late snowbanks, peaty soils
			Casc2/Cale1	G26	-	Marshes & streambeds & below snowbanks, poor-drain
		Saar/Acro		F11	-102	Gentle gravelly mod.-deep mod.-well-drained
		Acro/Bibi2		F1	95-	Alpine slopes protected mod.-shallow rocky SL
			Saphp/Dece	S48	(99-101)	Alpine bogs poorly-drained
		Feid/Trsp		G44	-	Alpine slopes sheltered deep
Pien1/Vasc				C41	85-108	Cool dry protected rocky
Pial/Vasc				C52	85-105	Timberline protected-above-exposed rocky droughty
Pial-Pif1/Podi				C51	-	Near timberline patchy exposed
Pial/Caro3				C50	76-105	Very cold rocky sedimentary exposed
Abla-Pien1/Pone2				C23	77-100	Warm southerly rocky acid gentle
Pien1/Juco				C37	74-103	Upper & middle slopes
		Feid/Luse		G43	80-100	Upland deep fine-textured sedimentary
		Feid/Dece		G41	80-100	Subalpine meadows, gentle loamy protected <u>c.c.</u>
Pien1/Arco2				C34	75-100	Gentle slopes
Pial/Juco				C51	80- 98	Dry cool steep rocky
Abla-Pien1/Vasc				C31	65- 98	All slopes subalpine characteristic <u>c.c.</u>
ph. Pial						Upper timberline & rocky upper-slopes
ph. Vasc						Upper elevations normal closed-canopy
ph. Shca						Lower elevations slopes & benches, shallow
ph. Arco2						Lower elevations deeper
Potrl/Syor1				D18	75-102	Benches & slopes, deep loamy well-drained
Abla-Pien1/RIBE				C24	84- 97	Cold upper-elevations loamy rocky
Pial/Feid				C51	95- 97	Dry cold open-canopy grassy
Pico/Vasc				C59	77- 98	Cold dry very-well-drained rocky-gravelly
Pico/Pone2				C57	79- 95	Dry open-canopy mid-to-upper-elevations
			Pien1/Cale1	C34	82- 95	Streambeds alluvial saturated soils
Pial/Cagel				C50	73- 95	Very cold, rocky, gentle
Psme/Syor1				C99	66- 96	Steep rocky northerly sedimentary
Pif1/Juco				C61	70- 95	Warm dry windswept ridges
	Artrv/Feid			S15	60- 95	Mtn. slopes upper elev. mod.-snow-accum. <u>c.c.</u>
	ph. Gevi					Deeper soils >70 ft, cooler
Abla-Pien1/Cagel				C15	79- 95	Gentle all-slopes & plateaus, Potrl/Pico-seral
Potrl/Thfel				D19	-	Sheltered benches, deep mod.well-drained moist
Abla-Pien1/Arco2				C11	74- 95	Dry benches sedimentary
ph. Asmi					74- 88	
ph. Shca					74- 88	
ph. Pien1					74- 87	
Abla-Pien1/Juco				C17	65- 94	Warm dry slopes
Abla-Pien1/Arla				C12	74- 93	Gentle upper-elevations
Psme/Juco				C93	65- 93	Exposed rocky ridgetops & upper-slopes
Pif1/Leki				C62	52- 92	Stony exposed ridgetops very-well-drained thin
Pico/Caro3				C56	-	Sparse cold very-well-drained
			Abla-Pien1/Caca	C13	60- 91	Stream terraces & seeps, saturated part of season
Potrl/Luar1				D16	-	Clay loam, deep dry
			Dece/CARE	G32	60- 90	Wet meadows stream terraces subirrigated poor-drain
			ph. Caaq			Montane-lower subalpine
Abla-Pien1/Mare				C19	66- 89	Cool rocky upper slopes northerly, Pif1 common
			Abla-Pien1/Setr	C27	-	Streams & bogs, lower water table by late season
Abla-Pien1/Thoc				C28	74- 89	Alluvial bottoms & northerly-lower-slopes
Abla-Pien1/Vagl				C30	72- 88	Moist upper-slopes all-slopes
ph. Vasc						In belt just above ph. Vagl
			Pipu-Pien1/Eqar	C35	60- 87	Stream terraces mod.deep non-rocky
		Fesc/Feid		G45	65- 86	L-SL deep sheltered gentle to mod.-steep
				S38	65- 86	Mod.-deep granitic mesic meadows
				S39	78- 84	Mod.-deep sedimentary mesic meadows
				S40	60- 85	Steep southerly well-drained rocky sandy
Pif1/Feid				C60	77- 85	Gravelly exposed ridges & upper slopes, thin
Psme/Acgl				C85	74- 85	Cold-air drainages, rocky northerly
ph. Pamy						Lower elevations
ph. Syor1						Sedimentary
Psme/Arco2				C87	65- 85	Dry lower- to mid-slopes, sedimentary
ph. Asmi						
Psme/Mare				C93	57- 85	Cool dry lower-elevations
ph. Juco					77- 85	Upper-elevations sandy
Potrl/Juco				D14	75- 85	Rocky upper slopes deep well-drained
		Feid/Rosp		G44	50- 85	Slopes, mod. deep sedimentary-volcanic <u>c.c.</u>
		ph. Stne				Moister higher elevations
	Arar3/Feid			S6	- 85	Shallow coarse non-calcareous
Abla-Pien1/Pamy				C22	73- 85	Acid-soils rocky lower-elevations northerly
	Artr1/Pose			S24	- 84	Shallow rocky well-drained
Abla-Pien1/Libo				C18	62- 84	Steep cool moist lower-slopes & benches, Psme-seral
ph. Vasc						Belt just above ph. Libo, Pico-seral
	Artr1/Feid			S24	76- 83	Gentle alluvial slopes & benches
	AMEL/Syor1-Artr			S4	70- 82	Snow-accumulation mod.deep, mod.well-drained
	ph. Rosp					Lower-elevations drier
Psme/Spbe				C98	66- 82	Warm dry upper-slopes southerly
Pien1/Libo				C38	62- 82	Lower slopes & benches
Abla-Pien1/Acru				C11	60- 82	Lower slopes & benches, alluvial, lower-elevations
			Pien1-Pipu/Gatr2	C36	61- 82	Stream-bottoms, terraces, & seeps
Pien1/moss				C38	73- 81	Steep moist warm sparse-understory
		Rosp/Stco1		G59	70- 80	Windy slopes & ridges sedimentary
			Cane/Dece	G22	75- 80	Subirrigated meadows deep poorly-drained
			Alint-Befo/SALI	S1	75- 80	Streambeds narrow low-gradient alluvial
Pico/Juco				C56	-	Warm dry rocky middle-elevations
Pico/Shca				C57	-	Cool dry colluvial-alluvial slope/bench sedimentary
Psme/Caru1				C88	66- 80	Cool mod.dry upper-slopes & ridges
ph. Pamy					60- 77	Lower elevations
Psme/Cagel				C89	65- 80	Lower elevations, sedimentary southerly
		Feid/Eltr		G42	50- 80	Gentle mod.-deep sedimentary
			Elpa/CARE	G36	75- 80	Wet meadows, water at surface
	Arlo3/Elsm			S10	- 80	Claypan frost-heave overflow
Potrl/Artr				D10	78- 79	Lower elevations, steep warm dry deep rocky
			Pien1/Cadi	C35	72- 79	Stream terraces, deep saturated soils
	Arar3/Rosp			S6	(45- 77)	Dry rocky deep well-drained clay
	Putr/Rosp			S41	75- 77	Dry rocky granitic
Abla-Pien1/Spbe				C28	67- 76	Lower-elevations warm dry
			Pipu/Alint	C44	70- 75	Streambeds, A and B channels

Psme/Phma		Poan3/Saex-Befo	C94	54-	75	Lower elevations, colluvial sedimentary
			D5	70-	75	Streambanks & floodplains
	Rosp/Pose		G58	30-	75	Windy ridges & slopes, sedimentary
Psme/Vagl			C101	61-	74	Northerly metamorphic-volcanic, loams
Psme/Syal			C98	57-	74	Lower slopes & benches, gravelly moist
Pien1/Phma			C39	-	72	Calcareous northerly
Abla-Pien1/Vace			C29	48-	72	Lower-elevations glacial benches & lower-slopes
	Arno/Rosp		S15	-	70	Shallow calcareous well-drain alluv-colluvial
		Rosp/Elsm	G57	40-	65	Gentle sedimentary
Psme/Feid			C92	-	60	Northerly upper-slopes open-canopy
	Artrv/Rosp)					
	Artrw/Rosp)-----	S20	40-	60		Clay subsoil sagebrush flats
	Artrt/Rosp)					
Jusc/Elsm			W1	-		Below coniferous forests, rocky ridges
Jusc/Rosp			W2	-		Moderately-steep northerly
	Rhart/Rosp		S47	-	55	Steep rocky shallow
	Save2/Leci		S61	30-	55	Concave toeslopes & floodplains, mod.well-drain

PLANT ASSOCIATIONS DESCRIBED FROM OTHER AREAS							
FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	From	Elev.	Distinguishing Features
	Cemo/Feid			S31	"WY"	-	Shallow rocky northerly moist
	Cemo/Rosp			S31	"WY"	55- 88	Mod.steep shallow rocky southerly
			Sawo/Caut	S59	w WY	66- 86	Wet alluvial meadows & seeps sandstones
			Sawo/Dece	S59	w WY	-	Lower-toeslopes & benches coarse/fine-loamy
			Sawo/Frvi	S60	w WY	62- 86	Benches & flats, coarse-loamy/fine-loamy
			Cam14/Dece	G21	w WY	63- 86	Gentle alluvial high-water poorly-drained
			Casi/Dece	G28	w WY	58- 84	Broad-meadows, seeps, & terraces, alluvial wet
			Pef1/Dece	S38	w WY	65- 83	Valley bottoms, loamy alluvial sedimentary
			Sawo/Caca	S58	e ID	-	Clayey riparian terraces & benches
			Sawo/Caaq	S59	w WY	64- 83	Alluvial wet meadows & seeps sedimentary deep
			Sabol-SALI/Caut	S50	w WY	59- 78	Alluvial gentle benches & terraces
			Sabol-SALI/Caca	S50	w WY	61- 75	Gentle slopes & benches, streamsides
			Saex-SALI/Caca-Eqar	S52	w WY	- 71	Alluvial streamsides fine-loamy no-deposition
			Salu/Eqar	S56	e ID	- 70	Within Sabol-shrubland, alluvial terraces
			Sage/Popa	S54	e ID	- 67	Broad valleys & benches, fine/clayey wet
	Atga/Elsm			S28	nc WY	-	Alluvial salt bottoms

KEY TO THE PLANT ASSOCIATIONS OF THE BIGHORN NATIONAL FOREST, WYOMING
(Please see instructions at beginning of keys for explanation of how to use this key)

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	Elev.	Distinguishing Features
Pico/Vasc			SapHP/Caaq	C59	77- 98	Cold dry upper-elevations very-well-drained
	Artrv/Feid			S57	85- 95	Streambanks & bogs, poorly-drained very-wet
		Dain/Podl		S15	(60- 95)	Mtn. slopes, upper-elevations, mod.snow-accumulation
Abla-Pienl/Vasc				G29	-	Alpine nr. treeline upper slopes shallow well-drain
ph. Vasc				C31	75- 93	All-slopes subalpine characteristic c.c.
ph. Shca						Upper-elevations closed-canopy
ph. Arco2						Lower elevations shallow
Abla-Pienl/Arco2						Lower elevations deeper soils
		Feid/Rosp		C11	83- 90	Dry benches sedimentary
Psme/Arco2				G44	72- 90	Mtn. slopes mod.deep sedimentary-volcanic
Psme/Mare				C87	73- 86	Dry lower- to middle-slopes, sedimentary
ph. Juco				C93	70- 86	Cool dry lower-elevations
Pienl/Vasc					77- 85	Upper-elevations sandy
ph. Luar				C41	66- 86	Cool dry all-slopes
Psme/Juco						Warmer
		Feid/Luse		C93	77- 85	Exposed rocky ridgetops & upper-slopes
Abla-Pienl/RIBE				G43	80- 85	Upland deep fine-textured sedimentary
				C24	70- 85	Cold upper-slopes, loamy
		Feid/Caob	Sage-SALI/Caca	S52	80- 85	Riverine overflow-in-spring mod.well-drained
		Feid/Leki		G41	70- 84	Gentle slopes mod-shallow sedimentary
Abla-Pienl/Libo				G43	-	Moist swales fine-textured sedimentary
ph. Vasc				C18	62- 84	Lower slopes & benches, steep warm moist, Psme-seral
Pico/Arad						Belt just above phase Libo, Pico-seral
			Pipu/Arco2	C54	78- 83	Warm dry well-drained granite lower-elevations
Pipo/Juco				C45	-	Streamside benches, A and B channels
Potrl/Luar				C73	76- 77	Shallow mod-elevations warm
Pifl/Cele				D16	70- 78	Clay loam deep dry
Psme/Syorl				C60	70- 73	Hot dry well-drained open-canopy exposed
				C99	72- 73	Steep rocky northerly sedimentary
			Saam-SapHP/Ashe	S50	65- 70	Riverine floodplains
	Arar3/Feid			S6	(63- 70)	Shallow coarse non-calcareous
	Arno/Rosp			S12	(- 70)	Shallow calcareous well-drained alluvial-colluvial
	Cele/Rosp			S29	(45- 68)	Dry hot rocky steep limestone
Psme/Phmo				C95	61- 66	Lower- to mid-slopes, cold-air drains, northerly
			Poan3/Phmo-Pavi	D5	45- 65	Streambanks and floodplains
Pipo-Jusc/Rosp				C81	- 60	Lower elevations, dry warm
			Poan3/Befo-RIBE	D4	55- 60	Streambanks & floodplains, mod.well-drained
Pipo/Feid				C72	43- 60	Sandy soils, well-drained gentle
Pipo/Spbe				C83	56- 59	Loamy cool moist gentle
Pipo/Phmo				C77	46- 59	Lower elevations, northerly
			Poan3/Saex-Befo	D5	45- 55	Streambanks and floodplains
Jusc/Rosp				W2	-	Moderately-steep northerly
Juos/Artr				W5	-	Shallow rocky below coniferous forests

PLANT ASSOCIATIONS DESCRIBED FROM OTHER AREAS

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	From	Elev.	Distinguishing Features
Psme/Cele				C90	UT-ID	63- 94	Dry v.exposed shallow rocky calcareous
	Cemo/Feid			S31	"WY"	-	Shallow rocky northerly moist
	Cemo/Rosp			S31	"WY"	55- 88	Mod.steep shallow rocky southerly
			Sawo/Caut	S59	w WY	66- 86	Wet alluvial meadows & seeps sandstones
			Sawo/Dece	S59	w WY	-	Lower-toeslopes & benches coarse/fine-loamy
			Sawo/Frvi	S60	w WY	62- 86	Benches & flats, coarse-loamy/fine-loamy
			Cami4/Dece	G21	w WY	63- 86	Gentle alluvial high-water poorly-drained
			Casi/Dece	G28	w WY	58- 84	Broad-meadows, seeps, & terraces, alluvial wet
			Pefl/Dece	S38	w WY	65- 83	Valley bottoms, loamy alluvial sedimentary
			Sawo/Caca	S58	e ID	-	Clayey riparian terraces & benches
			Sawo/Caaq	S59	w WY	64- 83	Alluvial wet meadows & seeps sedimentary deep
			Sabol-SALI/Caut	S50	w WY	59- 78	Alluvial gentle benches & terraces
			Sabol-SALI/Caca	S50	w WY	61- 75	Gentle slopes & benches, streamsides
			Saex-SALI/Caca-Eqar	S52	w WY	- 71	Alluvial streamsides fine-loamy no-deposition
Pifl/Juho				C62	sw ND	-	Steep upper-slopes & ridges, stony
Pifl/Pavi				C63	n UT	60- 70	Steep calcareous gravelly loamy rocky
			Salu/Eqar	S56	e ID	- 70	Within Sabol-shrubland, alluvial terraces
			Sage/Popa	S54	e ID	- 67	Broad valleys & benches, fine/clayey wet
Pifl/Rosp				C63	MT-ND	- 66	Steep shallow rocky calcareous
		Feid/Cahel		G40	se MT	38- 42	Parks in Pipo-forest loamy gentle
	Atga/Elsm			S28	nc WY	-	Alluvial salt bottoms

KEY TO THE PLANT ASSOCIATIONS OF THE BLACK HILLS NATIONAL FOREST, SOUTH DAKOTA AND WYOMING
(Please see instructions at beginning of keys for explanation of how to use this key)

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	Elev.	Distinguishing Features
Pipo-Juco/Syal			Pienl/Cadi	C35	62- 78	Stream terraces, deep saturated soils
Pigl/Juco				C74	56- 68	Cool moist higher-elevations limestone
Pipo/Arad				C42	57- 67	Cool moist middle- to upper-slopes
Pipo/Juco				C64	50- 67	Dry well-drained warm slopes
Pigl/Libo				C73	45- 66	Shallow mod.elevations warm
ph. Vasc				C43	58- 65	Northerly cool dry all-slopes
ph. Spbe					62- 64	Higher elevations
Potrl/Cocol				D12	40- 62	Deep soils, mostly-northerly
ph. Ptaq						Acid soils
ph. Arnul						
			Pigl/Cape4	C42	-	Lower slopes & streamsid es, cool moist rocky
Pipo/Spbe				C83	- 61	Loamy cool moist gentle
Pipo/Syal				C83	37- 60	Mesic sites, non-limestone <u>c.c.</u>
ph. Oras						Acid soils
ph. Mare						
Pipo/Phmo				C77	51- 57	Northerly slopes
Pipo/Rosp				C80	-	Limestone exposed (rare)
Pipo/Scsc-Elsm				C82	48- 55	Limestone rocky breaks & hills
Pipo/Dain				C71	49- 55	Gentle relatively-deep lower-elevations
Pipo-Jusc/Cemo				C70	50- 55	Lower-elevations limestone southerly
Pipo/Pavi				C76	51- 55	Lower-elevations steep moist lower-slopes & draws
ph. Cafo						Neutral soils
ph. Amal						Moister limestone
ph. Mare						
ph. Quma						Higher-precipitation lower-elevation, northern
ph. Ange						Mod.acid soils
		Sphe/CARE		G65	-	Moist bottomland, tallgrass
			"Sader/Dece"	-		Streamsid es and bottoms (other willow types too)
Pipo/Quma				C80	47- 53	Limestone moist cool, northern-part of Forest
Pipo/Cahel				C68	45- 52	Lower-elevations rocky ridges & gentle slopes, sandy
	Cemo-Rhart/Bocu			S30	41- 49	Steep shallow limestone-sedimentary
		Scsc/Bogr		G60	46- 47	Rolling hills limestone
		Stcol/Bogr		G66	- 46	Uplands loamy well-drained gentle
		Bogr/Elsm		G8	- 45	Shall loamy/silty dry droughty impermeable-subsoil
		Ange/Scsc		G1	- 45	Mod.moist tallgrass, deep fine-textured <u>c.c.</u>
Quma/Syoc				D21	35- 42	Lower slopes and benches, northern part
		Elsm/Bogr		G37	- 42	Loamy-clay handpan some-salt
		"Bogr/CARE"		G7	-	Sandy-loam
		Bogr/Buda		G6	-	Hard soils poorly-permeable <u>c.c.</u>
			Osvi-Quma/sparse	D3	38- 41	Canyons and northerly lower-slopes, loamy
			Osvi/Crsu	D2	-	Wooded-draws & springbranch canyons, clayey
			Frpe/Syoc	D1	-	Lower slopes & wooded-draws
			Posa-Poan3/SALI	D8	-	Floodplains & streamsid es, foothills
Pipo/Bocu				C66	- 39	Stony ridges limestone/limy-sandstone lower-elev.

PLANT ASSOCIATIONS DESCRIBED FROM OTHER AREAS

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	From	Elev.	Distinguishing Features
Pipo-Jusc/Syoc			Bepa/Cocol	C84	sw ND	-	Buttes & Pipo-parkland shale/sandstone loamy
	Cemo/Feid			D1	sw ND	-	Wooded-draws, loamy neutral-soils
	Cemo/Rosp			S31	"WY"	-	Shallow rocky northerly moist
		Feid/Cahel		S31	"WY"	55- 88	Mod.stee p shallow rocky southerly
		Stcol/Cahel		G40	se MT	38- 42	Parks in Pipo-forest loamy gentle
		ph. Sede		G69	MT-SD	32- 41	Parks in Pipo-forest loamy
		ph. Stvi				39- 41	Upper-elevations sandier
Potrl/Mare				D16	sw ND	36- 39	Less Stcol
	Juho/Cahel			D16	sw ND	36- 39	Ravines & wooded-draw slopes northerly sandy
	ph. Rosp			S36	sw ND	35- 36	Steep northerly sandy-loam
Potrl/Pavi							Less-organic more-sand
ph. Syal				D17	sw ND	24- 28	Upper-slopes of draws, northerly loamy
			Saca6-SALI/Caaq	S51	Sask.	-	Willow-bogs in Potrl-forest high-water
		Sphe/Stsp		G66	w ND	-	Tallgrass-prairie gentle well-drained moraine
Pifl/Juho				C62	sw ND	-	Steep upper-slopes & ridges, stony
		Stcol/Cael		G68	sw ND	-	V.shallow clayey rocky ridgetops high-sodium
	Juho/Scsc			S36	sw ND	23- 25	Steep upper-slope northerly shallow scoria
	ph. Pefl						Coarser sandy-loam

KEY TO THE PLANT ASSOCIATIONS OF THE MEDICINE BOW NATIONAL FOREST, WYOMING
(Please see instructions at beginning of keys for explanation of how to use this key)

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	Elev.	Distinguishing Features
		Acro/Trda		F2	103-110	Coarse windswept ridges shallow
			Saphp/Caaq	S57	(89-109)	Streambanks & bogs, subalp.-alpine poor-drain v.wet
		Acro-TRIF/Dece		F3	-106	Steep rocky solifluction snow-accumulation protected
		Sipr/Caeb		F15	100-106	
		Dece/Acro		G31	-106	Gentle lower-slopes mod-deep loamy protected
Abla-Pienl/Vasc				C31	77-106	All-slopes, subalpine characteristic c.c.
ph. Vasc						Upper-elevations
ph. Popul						Upper-elevations moist
ph. Cagel						Lower-elevations loamy warmer Potrl-seral
		Stcol/Caeb		G67	-103	Subalpine-parks protected snow-accumulation gentle
			Abla-Pienl/Caca	C13	90-100	Stream-terraces & seeps, saturated soils
Pifl/Leki				C62	84- 98	Stony ridgetops
ph. Pupa						
ph. Koma						
Pico/Vasc						
			Elpa/CARE	C59	77- 98	Cold dry upper-elevations gravelly v.well-drained
			Dece/CARE	G36	- 98	Wet meadows, water at surface
			ph. Cail	G32	90-	Wet meadows & stream terraces subirrigat. poor-drain
			Caaq/Caut	G16	-	High-subalpine to alpine
			ph. Caaq			Wet meadows poorly-drained
						Drier flat-benches
Abla-Pienl/moss				C21	-	Very-well-drained rocky steep upper-slopes northerly
Pico/Cagel				C55	78- 97	Deeper soil, v.well-drained sedimentary
Abla-Pienl/Vace				C29	(84- 96)	Lower-elevations glacial benches & lower slopes
Pico/Caro3				C56	-	Sparse cold very-well-drained
Pipo/Caro3				C69	62- 94	Gentle-slopes, v.dry v.well-drained granite
Pico/Juco				C56	84- 92	Warm dry rocky moderate-elevations
Pico/Arad				C54	-	Warm dry well-drained granite lower-elevations
Potrl/Cagel				D11	77- 91	Loam cool moist
Potrl/Lale				D15	80- 91	Loam non-rocky
		Dapal/Feid		G31	-	Subalpine-parks deep gentle fine-textured
	Arca3/Feid			S7	70- 90	Moist lower benches & toeslopes, parks, deep clay
	Putr-Artrv/Feid			S40	(80- 89)	Steep southerly well-drained rocky sandy
	Putr-Artrv/Rosp			S41	72- 89	Shallow southerly mod.-steep
	Artrv-Putr/Elda			S13	-	Coarse uplands
	Artrl/Feid			S24	- 89	Gentle alluvial slopes & benches
Potrl/Juco				D14	- 88	Rocky upper-slopes mod.well-drained
Pifl/Juco				C61	-	Warm dry windswept ridges, Potrl-seral
Abla-Pienl/Cagel				C14	- 87	All-slopes rel.deep loamy gentle Potrl-seral
Potrl/LIGU				D15	- 87	Deep poorly-drained loam non-rocky
	Artrv/Feid			S15	(78- 87)	Mtn. slopes upper-elevations mod.snow-accumulation
Potrl/Carul				D10	81- 86	Lower slopes & alluvial benches, cool dry
Potrl/Amal-Pavi				D8	74- 86	Lower-elevations steep well-drained, tall-shrubs
			Alint-Befo/SALI	S1	(69- 86)	Streamsides narrow-bottoms low-gradient alluvial
	AMEL/Cagel			S3	(63- 85)	Sheltered snow-accumulation deep loamy
Abla-Pienl/Carul				C14	(61- 85)	Gentle slopes
			Pipu/Arco2	C45	-	Streamside benches, A & B channels
Pico/Shca				C57	-	Cool dry alluvial-colluvial lower-slopes sedimentary
Pipo/Cagel				C67	61- 85	Gentle rocky slopes warm dry deep well-drained
ph. Luar						
ph. Sela						
		Rosp/Pose		G58	79- 83	Windy ridges & exposed upper-slopes, thin
	AMEL-Putr/Rosp			S4	73- 83	Steep mod.deep loamy
	AMEL/Syorl-Artr			S4	72- 82	Snow-accumulation mod.deep mod.well-drained
Psmo/Phmo				C95	59- 81	Steep northerly lower- to mid-slopes cold-air-drain
Pipo/Arad				C64	-	Dry well-drained warm slopes gentle
			Sage-SALI/Caca	S52	75- 80	Riverine overflow-in-spring mod.well-drained
Jusc/Rosp				W2	-	Mod.steep northerly
	Artrl/Stcol			S25	79- 80	Shallow rocky sandy-loam
	Artrv/Rosp)					
	Artrt/Rosp)			S20	76- 79	Clay-subsoil sagebrush-flats and benches
	Quga/Syorl			S46	(69- 78)	Cool moist mod.deep well-drained c.c.
		Stcol/Bogr		G66	- 71	Uplands loamy well-drained gentle
			Saex-SALI/POA	S52	(40- 65)	Lower-elevations tall-willow C-channel
			Poan3/Saex-Befo	D5	-	Streambanks and floodplains
	Arca3/Elsm			S8	60- 65	Alluvial flats & terraces, non-salty

PLANT ASSOCIATIONS				DESCRIBED FROM OTHER AREAS			
FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	From	Elev.	Distinguishing Features
	Cemo/Feid			S31	"WY"	-	Shallow rocky northerly moist
	Cemo/Rosp			S31	"WY"	55- 88	Mod.steep shallow rocky southerly
			Sawo/Caut	S59	w WY	66- 86	Wet alluvial meadows & seeps sandstones
			Sawo/Dece	S59	w WY	-	Lower-toeslopes & benches coarse/fine-loamy
			Sawo/Frvi	S60	w WY	62- 86	Benches & flats, coarse-loamy/fine-loamy
			Cami4/Dece	G21	w WY	63- 86	Gentle alluvial high-water poorly-drained
			Casi/Dece	G28	w WY	58- 84	Broad-meadows, seeps, & terraces, alluvial wet
			Pefl/Dece	S38	w WY	65- 83	Valley bottoms, loamy alluvial sedimentary
			Sawo/Caca	S58	e ID	-	Clayey riparian terraces & benches
			Sawo/Caaq	S59	w WY	64- 83	Alluvial wet meadows & seeps sedimentary deep
			Sabol-SALI/Caut	S50	w WY	59- 78	Alluvial gentle benches & terraces
			Sabol-SALI/Caca	S50	w WY	61- 75	Gentle slopes & benches, streamsides
			Saex-SALI/Caca-Eqar	S52	w WY	- 71	Alluvial streamsides fine-loamy no-deposition
			Salu/Eqar	S56	e ID	- 70	Within Sabol-shrubland, alluvial terraces
			Sage/Popa	S54	e ID	- 67	Rroad valleys & benches, fine/clayey wet
			Posa/Syoc-Saex	D7	ne CO	- 40	Plains-floodplains major-rivers

KEY TO THE PLANT ASSOCIATIONS OF THE THUNDER BASIN NATIONAL GRASSLANDS, WYOMING
(Please see instructions at beginning of keys for explanation of how to use this key)

(Please see instructions at beginning of keys for explanation of how to use this key)						
FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	Elev.	Distinguishing Features
Pipo/Cagel		Rosp/Pose		G58	-	Windy-ridges and exposed upper-slopes thin
				C67	-	Shale uplands mod.deep gentle
	Arca3/Elsm			S8	-	Alluvial flats & terraces non-salty
	Artrv/Elsm)	-----		S14	45- 50	Shallow to mod.deep, clay or silt
	Artrw/Elsm)					
		Stcol/Bogr		G66	-	Uplands loamy well-drained gentle
	Artrv/Stcol)					
	Artrw/Stcol)	-----		S22	45- 50	Benches & slopes, loamy mod.deep sedimentary
Artrt/Stcol)						
Pipo/Rosp			Elsm/Elac	G39	46- 50	Playas deep clay, occasionally-flooded
				C80	-	Limestone exposed ridges thin rocky
		Rosp/Bogr		G56	45- 50	Mod.deep ridges and hills
		Rosp/Elsm		G57	-	Gentle sedimentary
	Artrw/Rosp)	-----		S21	-	Clay-subsoil, sagebrush flats
	Artrt/Rosp)					
		Elsm/Bogr		G37	-	Loamy-clay hardpan some-salt
		ph. Stcol				Low-salt mod-deep
Quma/CORY3		ph. Stvi				Low-salt mod.well-drained
		Mucu/Scsc		G52	40- 45	Mod.steep non-salt well-drained shale
		Scsc/Bocu		G59	-	Alluvial-colluvial sandy rocky sedimentary
				D21	-	Lower slopes & benches limestone
		Bogr/Stcol		G10	-	Fine sandy-loam/ loam, deep carbonate layer (30 in)
		Bogr/Elsm		G8	-	Shallow loamy/SltC, dry droughty impermeable-subsoil
		Bogr/Eula		G9	-	Gentle shale
			Frpe/Pavi	D2	-	Wooded-draws & streambanks clay
			Posa/Syoc-Leci	D7	-	River floodplains alluvial
			Scam/CARE	G62	-	Sandy/silty fresh streambanks & lake-shores alluvial
	Save2-Artr/Elsm			S61	(40- 45)	Drainages and gulches, alluvial shale
	Save2/Spai			S62	-	Clay-loam floodplains highly-alkaline
	Save2-Atga/Pose			S62	-	Salty lowlands
			Disp/Puai	G35	-	Seeps & salt-flats CL-SC poorly-drained
			Disp/Elsm	G34	-	Saline alluvial-flats clay poorly-drained
			Disp/Spai-Elsm	G36	-	Slickspots & depressions high-water CL-C poor-drain

PLANT ASSOCIATIONS DESCRIBED FROM OTHER AREAS

PLANT ASSOCIATIONS DESCRIBED FROM OTHER AREAS							
FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	From	Elev.	Distinguishing Features
Pipo-Jusc/Syoc				C84	sw ND	-	Buttes & Pipo-parkland shale/sandstone loamy
	Cemo/Feid			S31	"WY"	-	Shallow rocky northerly moist
	Cemo/Rosp			S31	"WY"	55- 88	Mod.steep shallow rocky southerly
		Feid/Cahel		G40	se MT	38- 42	Parks in Pipo-forest loamy gentle
		Stcol/Cahel		G69	MT-SD	32- 41	Parks in Pipo-forest loamy
		ph. Sede				39- 41	Upper-elevations sandier
		ph. Stvi					Less Stcol
		Rosp/Cafi		G57	se MT	41- 42	Gentle shallow plateaus & buttes
		Rosp/Bocu		G56	se MT	32- 38	Hill-slopes scoria alkaline loamy
	Rhart/Cafi			S46	sw ND	32- 36	Upper-slopes in draws & protected ridges
	Juho/Cahel			S36	sw ND	35- 36	Steep northerly sandy-loam
	ph. Rosp						Less-organic more-sand
			Saca6-SALI/Caaq	S51	Sask.	-	Willow-bogs in Potrl-forest high-water
		Stsp/Mucu		G71	w ND	-	Steep northerly deep mixed-grass
		Sphe/Stsp		G66	w ND	-	Tallgrass-prairie gentle well-drained moraine
Pifl/Juho		Calo/Cahel		G14	nw SD	-	Rolling-hills gentle sandy well-drained
				C62	sw ND	-	Steep upper-slopes & ridges, stony
		Stcol/Cael		G68	sw ND	-	V.shallow clayey rocky ridgetops high-sodium
	Save2-Atco/Eltr			S60	sw ND	-	Steep upland-slope no-carbonates low-organic
	Save2/Rosp			S62	se MT	32- 35	Benches shales mod-steep slopes southerly
	Juho/Scsc			S36	sw ND	23- 25	Steep upper-slope northerly shallow scoria
	ph. Pefl						Coarser sandy-loam
	Atco-Artrw/Rosp			S27	MT-ND	-	Clayey badlands mod.steep southerly
	Arca3/Syoc-Elsm			S9	sw ND	19- 25	Alluvial terraces/lower-slopes loamy alkaline
	ph. Bogr						More-clay
		SUAE/Saru		F16	MT-SD	40- 45	Flats v.saline v.alkaline permanent-wet salty

KEY TO THE PLANT ASSOCIATIONS OF THE NEBRASKA NATIONAL FOREST, SOUTH DAKOTA AND NEBRASKA
(Please see instructions at beginning of keys for explanation of how to use this key)

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	Elev.	Distinguishing Features
Pipo/Syal				C83	-	Mesic non-limestone
Pipo/Cahel				C68	49- 52	Stony ridges & gentle slopes, sandy
Pipo/Scsc-Elsm				C82	42- 44	Limestone rocky breaks & hills
Pipo/Pavi				C76	42- 44	Lower-elevations steep moist lower-slopes & draws
Pipo/Bocu				C66	-	Stony ridges limestone/limy-sandstone
Jusc/Ormi				W2	20- 36	Steep upper slopes of badlands & breaks
	Arca3/Elsm			S8	-	Alluvial flats & terraces, non-salty
	Artrw/Stcol			S22	-	Benches & slopes, loamy mod.-deep sedimentary
		Calo/Stcol		G15	-	Ridges well-drain fine-S/fine-SL deep low-salt moist
		ph. Bogr				Clay-loams moist
		Scsc/STIP		G62	-	Upland well-drained sandy
		Scsc/Bohi		G61	36- 39	Sandy-hills eroding-ridgetops low-water-available
		Scsc/Cafi		G61	-	Mod.steep northerly SL-SIC low-salt sediment.shallow
		ph. Stcol				Sandy soil
		Scsc/Bocu		G59	-	Alluvial-colluvial shallow rocky sedimentary
		Elsm/Stvi		G39	30- 31	Sandy-loam loess nearly-flat mod.salt
		Elsm/Cafi		G38	-	Rolling uplands loam/sandy-loam
		Elsm/Bogr		G37	-	Loamy, clay-hardpan, some salt
		ph. Stcol				Low-salt mod.deep
		ph. Stvi				Low-salt mod.well-drained
		Elsm/Disp		G39	-	Terraces mod.salt moist SL/C-subsurf. flooded-spring
		Ange/Scsc		G1	-	Mod.moist tallgrass-prairie deep fine-textured c.c.
		Spas/Scsc		G65	-	Lower-slopes & benches, fresh-overflow in spring
		Anha/Calo		G3	24- 38	Sand-dunes choppy-sands/rolling-sands c.c.
		ph. Stcol				Harder soils
		ph. Ertr				Northerly-slopes upper-slopes
		ph. Scsc				
		Ange/Soav		G2	26-30	Sandhills lower-slopes poorly-drained
			ph. Sppe			High-water-table fresh
		Calo/Bogr		G14	-	Valleys & lower slopes in sandhills, more clay
		Calo/Spgr		G14	-	Dry valleys
		Bocu/Scsc		G4	-	Shallow rocky limestone/limy-shale
		Stcol/Bohi		G67	-	Rolling-hills & ridgetops
		Stcol/Cafi		G68	-	Uplands sandy low-salt coarse-subsoil
		Stcol/Bogr		G66	-	Uplands loamy well-drained gentle
		Bogr/Stcol		G10	-	Fine SL-L deep carbonate-layer 30 in
		ph. Calo				Loamy-sands low-moisture
		Bogr/Cael		G7	-	Ridges & upper-slopes, clay-loam
		Bogr/Elsm		G8	-	Shallow SL-CL-SIC dry droughty impermeable-subsoil
		ph. Buda				Heavy-clay soils
		Buda/Elsm		G12	-	Lower-slopes & swales, not-overflow, salty-subsoil
		Bogr/Buda		G6	-	Hard-soils poorly-permeable c.c.
			Frpe/Pavi	D2	-	Wooded-draws & streambanks, clay
			Frpe/Syoc	D1	26- 45	Wooded-draws, lower-slopes, & bottoms, streambanks
			Csvi/Crsu	D2	30- 35	Wooded-draws & springbranch canyons
			Posa/Riam	D7	-	Riverbanks and floodplains
			Sapel/Thpa1	S56	26- 30	Wet poorly-drained peat-soils fresh
			Caca/Casa2	G12	26- 30	Fresh streamides and lakes, flooded in spring
			Sppe/Caca	G64	-	Wet fresh sloughs and depressions
			Scam/CARE	G62	-	Fresh streamides and lake shores, sandy/alluv. silt
			Phco/Calal	G55	-	Fresh swamps with standing water in spring
			Tyla/Sala	F21	26- 30	Swamps and seeps fresh
	Save2-Artr/Elsm			S61	-	Drainages and gulches, alluvial shale salty
			SCIR/Disp	G63	-	Borders of salt-flats & depressions
			Disp/Elsm	G34	-	Saline alluvial flats, clay-loam poorly-drained
			Disp/Spai-Elsm	G36	-	Slickspots & depressions, high-water CL-C poor-drain
			ph. Sude			Higher-salt content
			Disp/Puai	G35	-	Seeps & salt-flats, CL-SC poorly-drained
			Puai/Trma	G56	-	Saline-depressions & salt-pans, wet high-salt

PLANT ASSOCIATIONS DESCRIBED FROM OTHER AREAS

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	From	Elev.	Distinguishing Features
Pipo-Jusc/Syoc				C84	sw ND	-	Buttes & Pipo-parkland shale/sandstone loamy
	Cemo/Feid			S31	"WY"	-	Shallow rocky northerly moist
	Cemo/Rosp			S31	"WY"	55- 88	Mod.steep shallow rocky southerly
		Feid/Cahel		G40	se MT	38- 42	Parks in Pipo-forest loamy gentle
		Stcol/Cahel		G69	MT-SD	32- 41	Parks in Pipo-forest loamy
		ph. Sede				39- 41	Upper-elevations sandier
		ph. Stvi					Less Stcol
		Rosp/Cafi		G57	se MT	41- 42	Gentle shallow plateaus & buttes
		Rosp/Bocu		G56	se MT	32- 38	Hill-slopes scoria alkaline loamy
	Rhart/Cafi			S46	sw ND	32- 36	Upper-slopes in draws & protected ridges
	Juho/Cahel			S36	sw ND	35- 36	Steep northerly sandy-loam
	ph. Rosp						Less-organic more-sand
		Saca6-SALI/Caaq		S51	Sask.	-	Willow-bogs in Potrl-forest high-water
		Ange/Sphe		G3	sw ND	-	Steep lower-slope fresh-water-root-season deep
		Stsp/Ange		G70	NE-SD	-	Tallgrass dry coarse silt-loams well-drained
		ph. Scsc					Uplands
		Stsp/Mucu		G71	w ND	-	Steep northerly deep mixed-grass
		Sphe/Stsp		G66	w ND	-	Tallgrass-prairie gentle well-drained moraine
		Calo/Cahel		G14	nw SD	-	Rolling-hills gentle sandy well-drained
Pifl/Juho				C62	sw ND	-	Steep upper-slopes & ridges, stony
		Stcol/Cael		G68	sw ND	-	V.shallow clayey rocky ridgetops high-sodium
	Save2-Atco/Eltr			S60	sw ND	-	Steep upland-slope no-carbonates low-organic
	Save2/Rosp			S62	se MT	32- 35	Benches shales mod-steep slopes southerly
	Juho/Scsc			S36	sw ND	23- 25	Steep upper-slope northerly shallow scoria
	ph. Pefl						Coarser sandy-loam
	Atca-Artrw/Elsm			S26	sw ND	-	Bandlands bentonite clay saline-surface
	Atco-Artrw/Rosp			S27	MT-ND	-	Clayey badlands mod.steep southerly
	Arca3/Syoc-Elsm			S9	sw ND	19- 25	Alluvial terraces/lower-slopes loamy alkaline
	ph. Bogr						More-clay
	Syoc/Elsm			S64	sw ND	23- 24	Upper-slope/benche thickets loamy mod.alkaline
		SUAE/Saru		F16	MT-SD	40- 45	Flats v.saline v.alkaline permanent-wet salty

KEY TO THE PLANT ASSOCIATIONS OF THE ARAPAHO-ROOSEVELT NATIONAL FORESTS, COLORADO
(Please see instructions at beginning of keys for explanation of how to use this key)

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	Elev.	Distinguishing Features
		Trna/Libi		F18	114-140	Windswept-ridges exposed thin well-drained
		Papu/Libi		F9	114-139	Flat exposed-ridges shallow gravelly
		Clme/Sasa		F5	128-135	Exposed high-ridge screes
		Sase/Febe		F14	113-132	Peak-faces high-summits shallow
		Acro/Bibi2		F1	112-132	Alpine-slopes protected mod.shallow sandy-loam rocky
		Acro/Caru		F1	-	Gentle upper-slopes gravelly thin
		Capel/Siac		G23	113-131	Rocky alpine snowpatches & fellfields
		Caru/Libi		G25	113-128	Fellfields & saddles, gravelly-stony windy exposed
		Cana/Beal		G21	126-128	Stabilized-scrree exposed-ridges
		Caar3/Libi		G17	114-128	Rocky alpine scree-slopes fine-clay
		Cael/Trda		G19	114-128	Moderate-slopes protected
		Caru/Trda		G25	114-125	Saddles thin
		Dece/Acro		G31	114-125	Gentle lower-slopes mod.deep loamy protected <u>c.c.</u>
			Casc2/Cale1 ph. Rhin	G26	107-125	Marshes & streamsidcs, below-snowbanks, poor-drain Rivulets at higher-elevations
		Komy/Acro-Caru		G50	113-124	"Grass"land mod-deep mod.well-drained gentle <u>c.c.</u>
			Saphp/Casc2	S57	113-124	Flat seeps & alpine-snowmelt-bogs
				S33	111-123	Mod.steep northerly windy gravelly
		Trpa/Acro		F19	111-123	Mod.deep sandy-loam rocky gentle snow-accumulation
		Trpa/Raad		F20	-123	Late-snowbanks snow-accumulation
		Trpa/Dece		F20	111-	High-meadows & turfs, rocky gentle
		Komy/Trda		G51	-122	Fellfields & turfs
		ph. Oral				
		Cael/OREO		G18	(119-122)	Moderate southerly mod-deep rocky
			Caca3/Bivi	G17	113-122	Wet rocky marshes & hummocks
		Arar4/Trpa-Libi		F4	112-121	Rocky snow-accumulation very-thin
		Caha/Poar2		G20	113-121	Late-snowpatches small-scrree
		ph. Podi				Lower-elevations
		Cafo/Acro		G20	109-120	Stabilized fine-talus near-treeline southerly
			Prpa2/Dece	F11	110-120	Streamsidcs & seeps & springs, snow-accumulation
		Trda/Libi		F17	109-120	Mod.rocky snow-accumulation deep
		Sipr/Libi-moss		F15	111-120	Snowpatches gentle
		ph. Poar2				
		Sipr/Capy		F15	-	Cold snow-accumulation
			Sagl1-Sabr1/Dece	S55	105-119	Subalpine-alpine well-drained sandy-loam
		Dain/Podi		G29	108-119	Nr.-treeline upper-slopes/benches shallow well-drain
		Anme/Poar2		F3	110-119	Rocky clay upper-alpine thin
		Saar/Acro		F11	106-119	Gentle gravelly mod.deep mod.well-drained
		ph. Casc2				
		Saren/Acro		F12	109-119	Moist cold snow-accumulation gentle gravelly
			Cale1/Clrh	F3	112-119	Marshes & streamsidcs near-treeline
			Cani/JUNC	G22	107-118	Depressions & late-snowbanks, peaty-soils
			Caca-Casc2/Meci	G13	110-118	Streambanks snow-accumulation
			Setr/Lifi	F14	108-118	Lower-alpine streambanks & wet scree snow-accum.
			Meci/Dece	F8	109-118	Moist-scrree & wet rocks, snow-accumulation
			Saod/Dece	F13	110-118	Streamsidcs, seeps, & marshes, snow-accumulation
				S54	110-117	Alpine snow-accumulation, acid-soils
			Saphp/Caaq	S57	89-117	Streambanks & bogs, poorly-drained very-wet
			ph. Dece		95-117	Higher-elevations
			Cami3/Bivi	G21	111-117	Marshy-depressions wet snow-accumulation
			Tral-Lifi/Erpel	F20	108-117	Streambanks near-treeline snow-accumulation
		Vasc-Vacel/Libi		S65	111-117	Alpine snow-patches southerly
		Acro/TRIF-Dece		F3	-117	Steep rocky solifluction snow-accum. protected
		Capy/Erme		G24	110-116	Shallow-slopes snow-accumulation-deep
			Capy/moss	G24	-	Streambanks
		Povi/Phse-Cisc		F10	113-116	Lower-alpine fine-talus exposed
		Judr/Sipr		G49	110-115	Rocky snow-patches
		Cisc/Aqco		F5	109-115	Alpine-screes thin snow-accumulation
		Hebr-Hepa2/Erpi2		F5	113-115	Steep rocky windy thin
Piar/Trda				C54	112-117	Closed-canopy sandy just-below-treeline east-slope
Piar/Feth				C53	110-	Shallow cold timberline patchy
Abla-Pien1/Sagl1				C26	113-117	Treeline moist krummholz open-canopy
Pifl/Trda				C64	105-115	Treeline exposed rocky
Abla-Pien1/Vasc				C31	88-115	All-slopes, subalpine characteristic <u>c.c.</u>
ph. Vasc						Upper-elevations Pico-seral
ph. Popul						Upper-elevations moist
ph. Cagel						Lower-elevations loamy Potri-seral
ph. Shca						Lower-elevations shallow rocky
	Rimo/Aqco			S48	113-115	Rocky slopes thin screes clay
	Ruid/Aqco			S49	108-114	Steep screes warm dry
		Abla-Pien1/Setr		C27	94-115	Streams & bogs, lower-water-table-late-season
		Caaq/Pegr1		G17	110-115	Marshes & springs nr.treeline, snow-accumulation
		Caco2/Cale1		F5	112-115	Streamsidcs & seeps & springs, snow-accum.
		Feth/Viam-Lale		G47	89-115	Subalpine parks alluvial-colluvial v.deep well-drain
		Lipo/Lupa2		F7	(105-125)	Subalpine moist claypan
Pien1/Trda				C39	108-114	Krummholz patchy
		Saphp/Dece		S58	94-113	High-subalpine poorly-drained bogs
Pif1/Capul				C59	97-110	Exposed-ridges cold dry thin
Pien1/Vasc				C41	(89-110)	Cool dry all-slopes
ph. Popu2						Moister
		Caaq/Caut		G16	90-110	Wet-meadows poorly-drained
		ph. Caaq				Slightly-drier flat benches
Potrl/Cagel				D11	80-108	Loam cool moist
Abla-Pien1/Vamy				C30	84-106	Middle-elevations upland
	Artrv/Feth			S17	87-105	Mtn.slopes upper-elevations deep mod.well-drained
Abla-Pien1/Cagel				C14	90-104	All-slopes, Potri-seral <u>c.c.</u>
		Dece/Cale1		G32	98-103	Subalpine meadows alluvial poorly-drained
		Rosp/Pofe		G58	78-100	Windy ridgetops shallow gravelly
Pico/Vasc				C59	90-101	Cold dry upper-slopes & ridges, very-well-drained
Pif1/Juco				C61	84-101	Warm dry windswept ridges exposed thin
		Abla-Pien1/Caca		C13	90-100	Stream-terraces & seeps, saturated-soils
Abla-Pien1/moss				C21	-	Higher-elevations v.well-drained rocky steep sparse
Potrl/Thfel				D15	80- 98	Sheltered deep moderately-well-drained moist
Abla/Cagel				C9	89- 98	Lower-elevations warm Potri-seral
Pico/Vamy				C58	80- 98	Steep middle- to lower-slopes, well-drained
Psme/Syor1				C99	62- 98	Steep rocky northerly shallow sedimentary
ph. Cagel						
Potrl/LIGU				D15	(83- 97)	Deep poorly-drained loam non-rocky moist
Potrl/Lale				D15	-	Loam non-rocky
Psme/Caro3				C90	57- 97	Steep northerly Pipo-codominant cool sparse
	Arca3/Feth			S8	88- 97	Meadows & parks, cold deep alluvial
		Feth/Feid		G46	(90- 96)	Deep clay well-drained rolling-hills <u>c.c.</u>
			Sage-SALI/Caca	S53	86- 90	Riverine owerflow-in-spring mod.well-drained
			ph. Dece		95-	Higher-elevations
Potrl/Feth				D13	87- 94	Warm dry southerly
		Sawo/Dece		S59	- 94	Streamsidcs & benches, coarse-soils
		Dece/CARE		G33	- 94	Wet subalp.meadow/stream-terracc.subirrig. poor-drain
		ph. Caaq				Montane-subalpine
Pipo/Caro3				C69	62- 94	Gentle-slopes very-dry very-well-drained granite
	Arca3/Feid			S7	(86- 93)	Moist lower-benches & toeslopes, parks deep clay

Psme/Jaam				C92	72- 92	Steep/very-steep rocky northerly shallow bouldery
Pico/Cagel				C55	82- 92	Deeper-soils, well-drained sedimentary
Psme/Cagel				C89	76- 92	Warm northerly slopes west-slope
Pico/Shca				C57	84- 92	Cool dry lower-slopes alluvial-colluvial sedimentary
Abla-Pienl/Libo				C18	- 92	Cool moist lower-elevations steep-slopes & benches
ph. Vasc						Belt just above ph. Vasc
Pico/Juco				C56	83- 91	Warm dry rocky well-drained
Pico/Arad				C54	-	Warm dry well-drained granite west-slope
	Artrv/Leki			S19	83- 91	Sedimentary gentle slopes
	Artrv/Rosp)					
	Artrt/Rosp)			S20	82- 90	Clay-subsoil sagebrush-flats & benches
Pipo/Putr				C78	65- 89	Dry well-drained benches sandy
	Putr-Artrv/Feid			S40	80- 89	Steep southerly well-drained rocky sandy
		Rosp/Pose		G58	82- 89	Windy-rdiges & exposed upper-slopes thin
			Pipu/Arco2	C45	74- 89	Streamsidcs & level-benches wet east-slope
Potrl/Vete				D20	(85-88)	Wet poorly-drained pockets clay
Pipo-Psme/Mumol				C75	78- 88	Shallow ridge/bench mod.exposed granite open-canopy
ph. Elda						Very-steep shallow
Psme/Arad-Juco				C86	72- 88	Rocky gentle slopes lower-elevations
	Artrt/Leci			S18	77- 88	Swales & drainages & terraces, alluvial
	Artrv/Feid			S15	(78- 87)	Mountain-slopes upper-elevations mod.snow-accum.
	Artrw/Stne			S23	76- 87	Shales
	Artrl/Feid			S24	82- 87	Gentle alluvial slopes & benches
	Putr/Mumol			S41	78- 87	Steep southerly granitic
		Dapal/Cahel		G30	80- 87	Parks gently southerly alluvial-colluvial volcanic
		ph. Scsc				
Pipo/Leki				C74	72- 86	Mod.- to upper-elevations gentle cool mod.moist
Jusc/Artr				W1	79- 86	Rocky-outcrops steep southerly moderately-alkaline
	Artrw/Leam			S17	75- 86	Very-steep slopes & canyons, very-rocky
			Alint-Befo/SAL1	S1	69- 86	Streamsidcs narrow low-gradient alluvial
Pipo/Cagel				C67	61- 85	Gentle rocky slopes warm dry deep well-drained
	AMEL/Cagel			S3	(63- 85)	Sheltered snow-accumulation deep loamy
	Syorl/Feth			S65	(- 85)	Moderately-steep southerly non-rocky subirrigated
			Sage-SAL1/Caut	S54	74- 85	Upper-montane moderately-poorly-drained
		Stcol/Mumol		G70	77- 84	Parks southerly colluvial metamorphic shallow
Jusc/Rosp				W2	76- 83	Moderately-steep northerly
Jusc/Putr				W2	70- 82	Rocky-outcrops steep southerly moderately-acid
	Artrv/Stcol)					
	Artrt/Stcol)			S22	77- 82	Benches & slopes, southerly loamy mod.deep
			Juar/CARE	G48	65- 82	Gentle alluvial terraces/seeps poor-drain deep wet
			ph. Cane			Lower-elevations
Psme/Phmo				C95	59- 81	Steep northerly lower-/mid-slopes cold-air-drains
		Mumol/Elda		G54	75- 80	Shallow sandy gravelly mod.steep ridges
			Poan3/Saex-Befo	D5	65- 78	Streambanks & floodplains
	Putr/Stcol			S42	59- 77	Mod.deep southerly sandy colluvial
		Stcol/Bogr		G66	53- 77	Uplands loamy well-drained gentle
		ph. Bocu			53- 56	Lower-elevations
Pipo/Cemo				C70	62- 74	Steep dry rocky slopes lower-elevations southerly
	Cemo/Elda			S30	57- 73	Mod.deep rocky gravelly-surface northerly
		Leam/Rice		G52	59- 73	Steep canyon-walls & talus, thin
Pipo/Cahel				C68	58- 72	Lower-elevations rocky ridges & gentle-slopes sandy
Jusc/Cemo				W1	62- 70	Rocky-outcrops moderately-steep northerly/southerly
	Cemo/Stcol			G32	57- 68	Mod.steep southerly
	ph. Rhart					Southerly slopes & ridges
			Posa/SAL1	D8	60- 63	Floodplains plains

PLANT ASSOCIATIONS DESCRIBED FROM OTHER AREAS							
FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	From	Elev.	Distinguishing Features
Pienl/Vace				C40	n UT	93-111	Lower-slope cold-air-drain non-calcar. rocky
Pico/Vace				C58	n UT	83-100	Lower-slope cold-air-drain dry non-calcareous
			Alint-Begl/Caaq	S2	nc CO	- 98	Marshy-pond-margins subalpine
Potrl/Sara				D18	UT	80- 90	Mid- to upper-slopes sedimentary
	Cemo/Feid			S31	"WY"	-	Shallow rocky northerly moist
	Cemo/Rosp			S31	"WY"	55- 88	Mod.steep shallow rocky southerly
		Sawo/Caut		S59	w WY	66- 86	Wet alluvial meadows & seeps sandstones
		Sawo/Dece		S59	w WY	-	Lower-toeslopes & benches coarse/fine-loamy
		Sawo/Frvi		S60	w WY	62- 86	Benches & flats, coarse-loamy/fine-loamy
		Cami4/Dece		G21	w WY	63- 86	Gentle alluvial high-water poorly-drained
		Casi/Dece		G28	w WY	58- 84	Broad-meadows, seeps, & terraces, alluvial wet
		Pefl/Dece		S38	w WY	65- 83	Valley bottoms, loamy alluvial sedimentary
		Sawo/Caca		S58	e ID	-	Clayey riparian terraces & benches
		Sawo/Caaq		S59	w WY	64- 83	Alluvial wet meadows & seeps sedimentary deep
Psme/Anal				C85	UT-ID	54- 79	Steep northerly warm moist lower-/mid-slopes
		Sabol-SAL1/Caut		S50	w WY	59- 78	Alluvial gentle benches & terraces
	Atco-Artrw/Rosp			S27	CO-WY	60- 76	Clayey badlands mod.steep southerly
		Sabol-SALI/Caca		S50	w WY	61- 75	Gentle slopes & benches, streamsidcs
		Saex-SAL1/Caca-Eqar		S52	w WY	- 71	Alluvial streamsidcs fine-loamy no-deposition
	Quga/Cahel			S44	ec CO	- 70	Upper-slopes & ridges, oak-savanna, east-slope
		Salu/Eqar		S56	e ID	- 70	Within Sabol-shrubland, alluvial terraces
		Sage/Popa		S54	e ID	- 67	Broad valleys & benches, fine/clayey wet
	Cemo-Rhart/Ange			S29	ne CO	57- 62	Gentle rocky well-drain stony/cobbly mod.deep
		Feid/Cahel		C40	se MT	38- 42	Parks in Pipo-forest loamy gentle
			Posa/Syoc-Saex	D7	ne CO	- 40	Plains floodplains major-rivers

KEY TO THE PLANT ASSOCIATIONS OF THE PAWNEE NATIONAL GRASSLANDS, COLORADO
(Please see instructions at beginning of keys for explanation of how to use this key)

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	Elev.	Distinguishing Features
Pifl/Juco				C61	-	Warm dry windswept ridges
	Pavi-Syoc/Elsm			S37	- 51	Wooded draws alluvial-colluvial
	Atca/Elsm-Bogr			S26	- 50	Floodplains alluvial
		Ange/Soav		G2	-	Sandhills lower-slopes poorly-drained
		ph. Sppe				High-water-table
		Scsc/Bogr		G60	- 51	Rolling hills
		Elsm/Cahel		G38	-	Lower-slopes, clay
		Stcol/Bogr		G66	- 51	Uplands loamy well-drained gentle
		Bogr/Cahel		G7	-	Sandy-loam uplands slowly-permeable
		Bogr/Elsm		G8	-	Loamy/silty-clay dry droughty impermeable-subsoil
		Bogr/Buda		G6	-	Hard clay soils impermeable
		Buda/CARE		G11	-	Bottoms & swales, clay-loam slowly-permeable
		Elsm/Disp		G39	-	Terraces occasion.-flood SL/C-subsurface mod.salt
			Disp/Spai-Elsm	G36	- 54	Slickspots-depressions high-water poorly-drain CL/C

PLANT ASSOCIATIONS DESCRIBED FROM OTHER AREAS							
FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	From	Elev.	Distinguishing Features
	Cemo/Feid			S31	"WY"	-	Shallow rocky northerly moist
	Cemo/Rosp			S31	"WY"	55- 88	Mod.steep shallow rocky southerly
	Atco-Artrw/Rosp			S27	CO-WY	60- 76	Clayey badlands mod.steep southerly
	Cemo-Rhart/Ange			S29	ne CO	57- 62	Gentle rocky well-drain stony/cobbly mod.deep
			Posa/Syoc-Saex	D7	ne CO	- 40	Plains floodplains major-rivers

KEY TO THE PLANT ASSOCIATIONS OF THE ROUTT NATIONAL FOREST, COLORADO
(Please see instructions at beginning of keys for explanation of how to use this key)

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	Elev.	Distinguishing Features
			Saphp/Caaq ph. Dece	S57	93-117 (95-117)	Streambanks & bogs, poorly-drained very-wet Higher-elevations
		Lipo/Lupa3		F7 C31	105-125 77-111	Subalpine moist claypan deep poorly-drained All-slopes, subalpine characteristic <u>c.c.</u>
Abla-Pienl/Vasc ph. Vasc ph. Cagel ph. Shca ph. Arco2			Abla-Pienl/Setr	C27 C41	- (89-110)	Upper-elevations Pico-seral Lower-elevations loamy Potrl-seral Lower-elevations shallow dry Lower-elevations warmer deeper Streamsides & bogs, lower-water-table-late-season
Pienl/Vasc	Artrv/Feth			S17	(87-105)	Cool dry all-slopes
Abla-Pienl/RIBE				C24	(87-104)	Mountain-slopes upper-elevations deep loamy Cold upper-elevations loamy patchy
Abla-Pienl/Cagel			Abla-Pienl/Caca	C13	90-100	Stream-terraces & seeps, saturated-soils
Psmc/Syorl ph. Cagel Pico/Shca Potrl/LIGU Potrl/Thfel Potrl/Lale				C15 C99	69-100 62- 98	Rolling hills, all-slopes & plateaus <u>c.c.</u> Steep rocky northerly shallow sedimentary
	Arca3/Feth			C57 D15 D19 D15	90- 97 83- 97 81- 97 -	Cool dry lower-slopes/benches, alluvial sedimentary Deep poorly-drained loam non-rocky moist Sheltered-benches deep mod.well-drained moist Loamy non-rocky
			Caaq/Caut ph. Elqu ph. Caaq	G16	(88- 97) - 95	Meadows & parks, cold deep alluvial Wet meadows poorly-drained Wettest, water-at-surface Slightly-drier flat benches
Potrl/Feth		Feth/Feid		D13 G46	(87- 93) -	Warm dry southerly Deep clayey well-drained rolling-hills
	Arca3/Feid			S7	86- 93	Moist lower-benches & toeslopes, parks deep clay
Potrl/Ptaq			Sage-SALI/Caut	S53	86- 92	Upper-montane streambanks & carrs, mod.poorly-drain
Potrl/Hesp				D17	69- 91	Poorly-drained acid-soils subirrigated
	Putr-Artrv/Feid		Sage-SALI/Caca	S52	(86- 90)	Riverine overflow-spring mod.well-drained
Potrl/Carul				D14	80- 89	Subirrig. benches/bottoms, cold-air-drain well-drain
Potrl/Vete				S40	(80- 89)	Steep southerly well-drained rocky sandy
Potrl/Ceve				D10	86- 88	Lower-slopes & alluvial-benches, cool dry
Potrl/Amal-Pavi ph. Quga ph. Asen-Thfel				D20 D11	85- 88 80- 88	Wet poorly-drained pockets clay Coarse very-well-drained slopes
	Artrv/Feid			D8	76- 88	Lower-elev. steep well-drain. tall-shrub warm Lower-elevations coarse Upper-elevations moist
Pifl/Juco				S15 C61	(78- 87) 83- 86	Slopes upper-elevations moderate-snow-accumulation Warm dry windswept ridges shallow
	Artrv-Putr/Elsm			S14	60- 85	Moderately-deep dark-brown-soil southerly
	AMEL/Syorl-Artr ph. Stle			S4	75- 85	Snow-accumulation mod.deep mod.well-drained Upper-elevations protected
	AMEL/Cagel			S3	63- 85	Sheltered snow-accumulation deep loamy
Potrl/Syorl			Pipu/Amal-Swse	C44	(72- 85)	Streamsides & lower-benches, A & B channels
Psmc/Pamy			Pipu/Alint	C44	-	Streamsides, A & B channels
	Arlo3/Rosp			D18	74- 84	Benches & slopes, well-drained
	Artrv/Rosp)			C97	71- 84	Steep rocky slopes coarse northerly sedimentary
	Artrt/Rosp)			S11	82- 84	Claypan overflow poorly-drained
	Artrw/Stne			S20	76- 84	Clay-subsoil sagebrush-flats & benches
Jusc/Rosp				S23	(80- 84)	Higher-elevations shales
Psmc/Phmo				W2	(76- 83)	Moderately-steep northerly warm v.dry
			Juar/CARE	C95	(59- 81)	Lower-slopes steep northerly cold-air-drains
	Quga/Syorl			G48	(65- 80)	Gentle alluvial terraces/seeps poorly-drain deep wet
	Amal-Pavi/Viam			S46	69- 78	Cool moist moderately-deep well-drained <u>c.c.</u>
	Quga/Amal			S5	69- 76	Coarse deep well-drained
	Quga-Pavi/Pamy			S42	69- 76	Upper- to mid-slopes, coarse/very-coarse
Pipo/Cagel				S45	-	Mod-steep lower-slopes & bottoms
	Artrw/Orhy			C67	- 72	Gentle rocky warm dry deep well-drained (rare)
				S20	(60- 70)	Lower-elevations hot moderately-deep loam

PLANT ASSOCIATIONS DESCRIBED FROM OTHER AREAS

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	From	Elev.	Distinguishing Features
Pienl/Vace				C40	n UT	93-111	Lower-slope cold-air-drain non-calcar. rocky
Pico/Vace				C58	n UT	83-100	Lower-slope cold-air-drain dry non-calcareous
Potrl/Sara			Alint-Begl/Caaq	S2	nc CO	- 98	Marshy-pond-margins subalpine
				D18	UT	80- 90	Mid- to upper-slopes sedimentary
	Cemo/Feid			S31	"WY"	-	Shallow rocky northerly moist
	Cemo/Rosp			S31	"WY"	55- 88	Mod.steep shallow rocky southerly
	Artrw-Syorl/Leci?			S18	nw CO	60- 86	Gentle mod-deep lower-slopes
			Sawo/Caut	S59	w WY	66- 86	Wet alluvial meadows & seeps sandstones
			Sawo/Dece	S59	w WY	-	Lower-toeslopes & benches coarse/fine-loamy
			Sawo/Frvi	S60	w WY	62- 86	Benches & flats, coarse-loamy/fine-loamy
			Cami4/Dece	G21	w WY	63- 86	Gentle alluvial high-water poorly-drained
			Casi/Dece	G28	w WY	58- 84	Broad-meadows, seeps, & terraces, alluvial wet
			Pefl/Dece	S38	w WY	65- 83	Valley bottoms, loamy alluvial sedimentary
			Sawo/Caca	S58	e ID	-	Clayey riparian terraces & benches
			Sawo/Caaq	S59	w WY	64- 83	Alluvial wet meadows & seeps sedimentary deep
Psmc/Amal				C85	UT-ID	54- 79	Steep northerly warm moist lower-/mid-slopes
			Sabol-SALI/Caut	S50	w WY	59- 78	Alluvial gentle benches & terraces
			Sabol-SALI/Caca	S50	w WY	61- 75	Gentle slopes & benches, streamsides
			Saex-SALI/Caca-Eqar	S52	w WY	- 71	Alluvial streamsides fine-loamy no-deposition
	Atco-Artrw/Rosp			S27	CO-WY	60- 76	Clayey badlands mod.steep southerly
Abco-Psmc/Amal				C1	n UT	54- 70	Steep northerly lower-/mid-slopes & benches
			Salu/Eqar	S56	e ID	- 70	Within Sabol-shrubland, alluvial terraces
			Sage/Popa	S54	e ID	- 67	Broad valleys & benches, fine/clayey wet
			Cane/Caaql-Juar	G22	nw CO	-	Below-cold-fresh-springs

KEY TO THE PLANT ASSOCIATIONS OF THE WHITE RIVER NATIONAL FOREST, COLORADO
(Please see instructions at beginning of keys for explanation of how to use this key)

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	Elev.	Distinguishing Features
		Trna/Libi		F18	116-132	Windswept ridges exposed thin well-drained
		ph. Papu		F1	118-132	Gentle upper-slopes gravelly thin
		Acro/Caru		G50	119-128	"Grass"land mod.deep well-drained gentle <u>c.c.</u>
		Komy/Acro-Caru		F1	118-128	Protected slopes mod.shallow sandy-loam rocky
	Droc/Caru	Acro/Bibi2		S33	119-126	Moderately-steep northerly exposed gravelly More-neutral soils
	ph. Libi					
		Dece/Acro		G31	114-126	Gentle lower-slopes mod-deep loamy protected
			Casc2/Cale1	G26	116-125	Marshes & streamsides, below snowbanks poor-drain
		Saar/Acro		F11	118-124	Gentle gravelly mod.deep mod.well-drained
			Sag11-Sabrl/Dece	S55	114-123	High-subalpine/alpine well-drained sandy-loam Lower-elevations drier
			ph. Popul			
			Saphp/Casc2	S57	114-123	Flat seeps & alpine-snowmelt-bogs poorly-drained
		Lipo/Lupa3		F7	(105-125)	Subalpine moist claypan deep
Abla-Pien1/Sag11				C26	116-118	Treeline moist krummholz open-canopy
Abla-Pien1/Vasc				C31	98-116	All-slopes subalpine characteristic <u>c.c.</u> Upper-elevations, Pico-seral Lower-elevations loamy Potrl-seral Lower-elevations shallow dry Lower-elevations warmer deeper-soils
ph. Vasc						
ph. Cagel						
ph. Shca						
ph. Arco2						
			Abla-Pien1/Setr	C27	(94-115)	Streamsides & bogs, lower-water-table-late-season
		Pone2/Stle		G55	106-114	Lower-slopes & benches, deep well-drained
		Dain/Podi		G29	92-114	Nr.treeline upper-slopes/benches, shallow well-drain
			Dece/Cale1	G32	95-111	Subalpine meadows alluvial poorly-drained Better-drained snow-accumulation-deep
			ph. Raal			
Pien1/Vasc				C41	(89-110)	Cool dry all-slopes
			Saphp/Cale1	S56	94-109	Poorly-drained middle-subalpine carrs & bogs
			Caaq/Caut	G16	91-109	Wet meadows poorly-drained Wettest, water at surface
			ph. Elqu			
		Feth/Viam-Lale		G47	82-108	Parks alluvial-colluvial very-deep well-drained
Abla-Pien1/Cagel				C14	87-107	All-slopes gentle loamy Potrl-seral
Abla-Pien1/Juco				C17	105-106	Warm dry rocky
		Lipo/Viam		F7	95-105	Subalpine moist mod-deep dense-clay-subsoil
Potrl/Thfe1				D19	83-104	Sheltered benches deep mod.well-drained moist
Abla-Pien1/R1BE				C24	87-104	Cold upper-elevations loamy sparse patchy
Pico/Vasc				C59	(90-101)	Cold dry upper-elevations very-well-drained
			Abla-Pien1/Caca	C13	90-100	Streamsides & seeps, saturated
Potrl/Cagel				D11	77-100	Loamy cool moist
Abla-Pien1/Pamy				C22	79-100	Acid-soils rocky lower-elevations northerly
	Artrv/Feth			S17	95-100	Mountain-slopes upper-elevations deep loamy
		Rosp/Pose		G58	91-100	Windy-ridges & exposed-upper-slopes, thin
		Feid/Eltr		G42	96- 99	Mod.deep well-drained lower-slopes northerly Drier upper-slopes
		ph. Ipag				
	Artrv/Feid			S15	90- 98	Mountain-slopes upper-elev. mod.snow-accumulation
		Feth/Feid		G46	91- 98	Deep clay well-drained, rolling-hills
Potrl/Syor1				D18	80- 97	Benches & slopes, well-drained
				G43	93- 97	Gentle uplands & ridges, convex deep well-drained
Potrl/Hesp				D14	78- 96	Subirrigated bench/bottom well-drain. cold-air-drain
Potrl/LIGU				D15	93- 95	Deep poorly-drained loamy non-rocky
Abla-Pien1/Vamy				C30	94- 95	Middle-elevations upland
Abla-Pien1/Rupa				C25	83- 94	Warm lower-slopes limestone/limy-shales/volacnics Belt just above ph. Rupa
ph. Vasc						
Pico/Shca				C57	86- 94	Cool dry lower-slopes alluvial-benches sedimentary Moister
ph. Pamy						
Abla-Pien1/Libo				C18	89- 93	Lower-elevations steep cool moist slopes Psme-seral Belt just above ph. Libo, Pico-seral
ph. Vasc						
Pico/Cagel				C55	86- 92	Deeper well-drained sedimentary
Potrl/Amal-Pavi				D8	86- 92	Lower-elevations steep well-drained tall-shrub
ph. Acgl						
	Pefl/Feth			S39	89- 91	Floodplains & wet-screes, just above willow-riparian
Potrl/Feth				D13	85- 90	Warm dry southerly
Psme/Pamy				C97	78- 89	Steep rocky slopes coarse northerly sedimentary
Potrl/Ptaq				D17	- 88	Poorly-drained acid-soils subirrigated
	AMEL/Syor1-Artr			S4	81- 85	Snow-accumulation mod.deep mod.well-drained Upper-elevations protected
	ph. Stle					
	AMEL/Cagel			S3	74- 85	Sheltered snow-accumulation deep loamy
		Pipu/Amal-Swse		C44	72- 85	Streamsides & lower-benches, A & B channels Lower-gradient, flooded-in-spring
		ph. Swse				
Psme/Quga				C96	81- 84	Moist slopes & ridges lower-elevations loamy
	Artrv-Putr/Elsn			S14	81- 83	Moderately-deep dark-brown southerly
	Arno/Basa2			S11	75- 82	Exposed windswept bench/terrace deep well-drained
Psme/Syor1				C99	68- 82	Steep rocky northerly shallow sedimentary
ph. Cagel						
	Quga/Amal			S42	70- 82	Upper- to middle-slopes, coarse/very-coarse
		Juar/CARE		G48	65- 82	Gentle alluvial terraces/seeps, poor-drain deep wet Lower-elevations
		ph. Cane				
	Quga-Pavi/Pamy			S45	75- 81	Mod.steep bottoms to lower-slopes
Pied-Juos/Artr				W4	(60- 80)	Shallow sandy sandstone hot
Pied-Juos/Amut-Cemo				W3	68- 79	Southerly shallow well-drained rocky
Pied/Quga				W9	68- 79	Middle-elevations steep deep well-drained
	Quga/Syor1			S46	77- 79	Cool moist moderately-deep well-drained <u>c.c.</u>
		Poan3/Amal		D4	59- 79	Narrow-benches & floodplains, mod-well-drained
		ph. Acna				
Juos/Cemo-Pera2				W7	64- 77	Southerly sedimentary steep
Pipo/Cagel				C67	72- 73	Gentle rocky warm dry (very-rare)
Juos/Orhy				W8	(60- 73)	Lower-elevations gravelly shale
Juos-Pied/Rosp				W10	(55- 71)	Lower-elevations shallow sedimentary
	Artrw/Orhy			S20	(60- 70)	Lower-elevations hot moderately-deep loamy

PLANT ASSOCIATIONS DESCRIBED FROM OTHER AREAS

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	From	Elev.	Distinguishing Features
Pien1/Vace				C40	n UT	93-111	Lower-slope cold-air-drain non-calcar. rocky
Pico/Vace				C58	n UT	83-100	Lower-slope cold-air-drain dry non-calcareous
Potrl/Sara				D18	UT	80- 90	Mid- to upper-slopes sedimentary
	Artrw-Syor1/Leci?			S18	nw CO	60- 86	Gentle mod-deep lower-slopes
		Sawo/Caut		S59	w WY	66- 86	Wet alluvial meadows & seeps sandstones
		Sawo/Dece		S59	w WY	-	Lower-toeslopes & benches coarse/fine-loamy
		Sawo/Frvi		S60	w WY	62- 86	Benches & flats, coarse-loamy/fine-loamy
		Cami4/Dece		G21	w WY	63- 86	Gentle alluvial high-water poorly-drained
		Casi/Dece		G28	w WY	58- 84	Broad-meadows, seeps, & terraces, alluvial wet
		Pefl/Dece		S38	w WY	65- 83	Valley bottoms, loamy alluvial sedimentary
		Sawo/Caca		S58	e ID	-	Clayey riparian terraces & benches
		Sawo/Caaq		S59	w WY	64- 83	Alluvial wet meadows & seeps sedimentary deep
Psme/Amal				C85	UT-ID	54- 79	Steep northerly warm moist lower-/mid-slopes
		Sabot-SALI/Caut		S50	w WY	59- 78	Alluvial gentle benches & terraces
	Atco-Artrw/Rosp			S27	CO-WY	60- 76	Clayey badlands mod.steep southerly
		Sabot-SALI/Caca		S50	w WY	61- 75	Gentle slopes & benches, streamsides
Pied-Juos/Pofe				W9	nw CO	60- 72	Gentle northerly slopes & mesas non-calcareous
		Saex-SALI/Caca-Eqar		S52	w WY	- 71	Alluvial streamsides fine-loamy no-deposition

Abco-PSme/Amal

Pied-Juos/Putr

	C1	n	UT	54- 70	Steep northerly lower-/mid-slopes & benches
Salu/Eqar	S56	e	ID	- 70	Within Sabol-shrubland, alluvial terraces
	W9	UT-CO		64- 67	Gentle mesa/ridge fine-sandy sediment. sparse
Sage/Popa	S54	e	ID	- 67	Broad valleys & benches, fine/clayey wet
Swe/Hesp	S64	e	ID	- 66	Flat alluvial benches & streamcides deep loamy
Cane/Caaq1-Juar	G22	uw	CO		Below cold fresh springs

KEY TO THE PLANT ASSOCIATIONS OF THE GRAND MESA, UNCOMPAHGRE, and GUNNISON NATIONAL FORESTS, COLORADO
(Please see instructions at beginning of keys for explanation of how to use this key)

17

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	Elev.	Distinguishing Features
		Saren/Acro		F12	118-136	Moist cold snow-accumulation gentle gravelly
		Cael/Acro		G18	123-130	Moist to dry "grass"lands, mod.deep
			Caco2/Cale1	F5	116-130	Streamsides, seeps, & springs, snow-accumulation
		Poar2/Bivi		G55	128-129	Snowpatches
		Dece/Acro		G31	119-129	Gentle lower-slopes mod.deep loamy protected
			Sag11-SALI/CARE	S55	(128-129)	Subalpine-alpine, wet poorly-drained
		Caru/Komy		G24	127-128	Very-shallow fellfields & saddled, windy
		Trna/Libi		F18	127-128	Windswept ridges exposed thin well-drained
		Trna/Erpi2		F18	120-	Fellfields exposed
		Trpa/Acro		F19	127-128	Mod.deep sandy-loam rocky gentle snow-accumulation
		Cael/Trda		G19	118-128	Moderate-slopes protected
		Acro/Bibi2		F1	118-128	Alpine slopes protected mod.shallow sandy-loam rocky
			Casc2/Bivi	F26	127-128	Marshy patches
			Kosi/Bivi	G52	127-128	Small marshes near lakes & ponds
			Casc2/Cale1 ph. Rhin	G26	106-128	Marshes & streamsides, below-snowbanks poorly-drain Rivulets at higher-elevations
		Clme/Siac		F6	126-127	Highest-ridges screes thin
		Smca/Arbo		F16	-127	Rocky summits & ridges, thin
		Caru/Libi		G25	125-126	Fellfields & saddles, gravelly/stony wind-exposed
		Komy/Acro-Caru		G50	125-126	"Grass"land mod.deep well-drained gentle <u>c.c.</u>
	Droc/Caru			S33	123-125	Mod.steepest northerly exposed gravelly
		Cana/Beal		G21	124-125	Stabilized-screes exposed ridges
		Cael/Sede		G19	123-125	Deep non-rocky "grass"land
		Caha/Poar2 ph. Podi		G20	-125	Late-lying snowpatches small-scrree Lower-elevations
		Caen/Saren		G19	124-125	Late-lying snowpatches
		Saar/Trpa		F12	124-125	Small marshy-patches late-snowcover
	Vasc-Vacel/Libi			S65	123-124	Alpine snowpatches southerly
		Phal/Peha		F10	123-124	Steep fast-moving-scrree thin
		Capu/Hemo		G13	123-124	Lower-alpine rocky
		Cael/OREO		G18	123-124	Gentle to moderate-slopes southerly mod.deep rocky
			Saphp/Casc2	S57	106-123	Flat seeps & snowmelt bogs
		Dece/Judr		G34	122-123	Late-snowpatches steep southerly
		Judr/Sipr		G49	122-123	Rocky snowpatches
		Cafo/Acro		G20	121-122	Stabilized fine-talus near-treeline southerly
			Sag11-Sabr1/Dece	S55	120-121	Subalpine-alpine well-drained sandy-loam
			Saphp/Caaq	S57	93-121	Streambanks & bogs, poorly-drained very-wet
		Erco3/0xde		F6	120-121	Screes sparse
			Caaq/Pegr1	G17	120-121	Marshes & springs near-treeline snow-accumulation
			Can/JUNC	G22	120-121	Alpine depressions late-snowbanks peaty-soils
			Prpa2/Dece	F11	120-121	Streamsides, seeps, & springs, snow-accumulation
		lvgo/Erfe		F7	119-120	Small-scrree sparse
		Saren/Vace		F13	-120	Well-drained snowbanks
	Droc/Saren			S34	118-119	Moving-scrree slopes alpine rocky
		Saar/Erme		F12	118-119	-
		Capu/Pogl		G13	118-119	Lower-alpine rocky
		Trda/Libi		F17	118-119	Mod.rocky snow-accumulation deep
		Capy/Erme		G24	118-119	Deep-winter-snow lower-slopes
		Anme/Poar2		F3	110-119	Rocky clay upper-alpine thin
		Sipr/Libi-moss		F14	-	Snowpatches gentle
		Trpa/Dece		F20	116-117	High-meadows & turfs, rocky gentle
		Dain/Dece ph. Oral		G28	119-120	Early-melting-snowbanks meadows shallow Lower-elevations
		Lipo/Lupa3		F7	105-127	Subalpine moist claypan deep loamy
		Feth/Viam-Lale		G47	85-125	Parks alluvial-colluvial very-deep very-well-drained
Abla-Pien1/Sag11				C26	121-122	Timberline moist krummholz open-canopy
Piar/Feth				C53	119-120	Shallow cold timberline patchy
		Povi/Erpi		F10	118-119	Near-treeline
	Rimo/Popul			S48	117-118	Steep screes
	Juco-RIBE/Feth			S35	92-118	Steep moving-screes
			Begl/Popul	S28	117-118	Dry rocky near-treeline
			Cale1/Clrh	F4	117-118	Marshes & streamsides, near-treeline
			Saphp/Cale1	S56	116-117	Poorly-drained middle-subalpine
Abla-Pien1/Vamy				C30	90-116	Middle-elevation upland
Pef1/Ciau				S37	114-115	Subalpine fast-moving screes
		Feth/Oral		G47	114-115	Steep fine-scrree upper-subalpine
			Caaq/Caut ph. Elqu ph. Caaq	G16	85-115	Wet meadows poorly-drained Wettest sites, water at surface Somewhat-drier flat benches
		Dain/Podi		G29	(92-114)	Near-treeline upper-slope/bench shallow well-drained
		Seat/Phhe		F14	112-113	Steep fast-moving-screes sparse
Potr1/Thfel				D19	84-112	Sheltered benches deep mod.well-drained moist
	Vace/Bltr			S65	111-112	Forest-openings rocky
Abla-Pien1/RIBE				C24	110-111	Cold upper-elevations loamy patchy sparse
Ruid/Aqco				S49	109-110	Steep screes warm dry
			Capr1/Caaq ph. Elqu	G23	109-110	Boggy bottoms poorly-drained peaty-soils Wettest, water at surface
Abla-Pien1/Arco2				C11	93-109	Dry benches sedimentary
		Dain/Stle		G29	108-109	Forest-openings
		Feid/Eltr		G42	91-109	Mod.deep well-drained lower-slopes northerly
			Begl/Casc2	S28	-109	Valley marshes & bogs
Abla-Pien1/Cagel				C14	88-108	All-slopes deep gentle Potr-seral <u>c.c.</u>
			Caca-Casc2/Meci	G13	107-108	Streamsides near-treeline snow-accumulation
			Dece/CARE ph. Caaq	G32	90-	Wet meadows/stream-terraces, subirrigated poor-drain Montane-subalpine
Pico/Vasc				C59	106-107	Cold dry upper-elevations very-well-drained
Pico/Juco				C56	86-107	Warm dry rocky moderate-elevations well-drained
Pien1/moss				C38	97-106	Steep moist warm sparse
Potr1/Cagel				D11	90-105	Loamy cool moist
Potr1/Feth				D13	92-105	Warm dry southerly
Potr1/Arad				D10	-105	Talus & scree slopes
	Artrv/Feth			S17	85-105	Mountain-slopes upper-elevations deeper-soils
Pico/Cagel ph. Pamy				C55	77-104	Deeper-soils well-drained sedimentary Upper-elevations
Pipo/Arad-Juco				C86	98-104	Rocky gentle slopes dry
		Dapal/Feid		G31	103-104	Parks deep gentle fine-textured
		Feth/Dapal		G45	-	Deep rocky canyonsides
		Feth/Feid		G46	95-104	Deep clay well-drained rolling-hills
Abla-Pien1/Juco				C17	-103	Warm dry
		Pone2/Stle		G55	-103	Lower-slopes & benches, deep well-drained
Potr1/Ptzq				D18	84-102	Poorly-drained acid-soils subirrigated
Piar/Juco				C53	-101	Shallow dry lower-subalpine sparse
	Pef1/Feid			S38	98-101	Mod.deep granitic mesic meadows
			Abla-Pien1/Setr	C27	100-101	Streamsides & bogs, lower-water-table-late-season
			Dece/Cale1	G32	100-101	Subalpine meadows alluvial poorly-drained
			Vete/Hesp	F22	89-101	Colluvial-alluvial clay poorly-drained
			Meci/Dece	F8	-101	Most-scrree & wet-rocks, snow-accumulation
Potr1/LIGU				D15	94-100	Deep poorly-drained loamy non-rocky moist
Piar/Fearl				C52	94-100	Cold dry rocky lower-subalpine patchy
Pipo/Fearl				C71	98-100	Cool moist gentle (rare)

Psme/Pamy			C97	99-100	Steep rocky northerly coarse sedimentary
Psme/Feid			C92	99-100	Northerly upper-slopes Pipo-codominant open-canopy
	Feth/Fearl		G46	97-100	Gentle deep rocky
	Fearl/Mumol		G40	99-100	Meadows deep gravelly
		Abla-Pienl/Caca	C13	89-100	Streamside & seeps, saturated-soils
		Caaq/Cahol	G16	99-100	Wet meadows acid-soils
Abla-Pienl/moss			C21	98- 99	Very-well-drained rocky steep upper-slopes
Pipu-Psme/Fearl			C47	98- 99	Warm dry upper-slopes
Potrl/Fearl			D13	97- 98	Thin
Abla/Cagel			C9	- 98	Warm lower-slopes Potrl-seral
		Abla-Pienl/Acgl	C10	-	Streamside benches
Pico/Vamy			C58	(80- 98)	Steep mid- to lower-slopes, upper-elevations
Psme/Cagel			C89	97- 98	Warm northerly slopes
Psme/Jaam			C92	- 98	Steep/very-steep rocky northerly shallow bouldery
Psme/Putr			C98	92- 98	Gentle exposed slopes
		Juar/CARE	G48	97- 98	Gentle alluvial terrace/seep poorly-drained deep wet
			S45	75- 98	Cool moist mod.deep well-drained <u>c.c.</u>
	Quga/Syorl				
	ph. Artr				
Psme/Mare			C93	-	Cool dry lower-elevations
	Quga/Amal		S42	74- 97	Upper-/mid-slopes coarse-v.coarse
	ph. Mare				Shallower cooler
		Ciau/Cyfr	F13	96- 97	Rocky-outcrops & cliffs
	Artrv/Feid		S15	95- 96	Mountain-slopes upper-elevations mod.snow-accum.
	Arca3/Feid		S7	95- 96	Moist lower-benches & toeslopes, parks deep clay
		Alint-Sadr/Eqar	S2	- 96	Flooded overflow
	Arca3/Feth		S8	94- 95	Meadows & parks, cold deep alluvial
	Rice/Feid		S48	94- 95	Steep-screes warm dry
		Mumol/Fearl	G54	94- 95	Dry deep fine-textured rocky
		Dapal/Fearl	G30	94- 95	Rocky ledges & steep rocky slopes
		Dece/Eltr	G34	94- 95	Gentle slopes & bottoms, deep
Pifl/Juco			C61	- 94	Warm dry windy ridges
Potrl/Amal-Pavi			D8	79- 94	Lower-elevations steep well-drained tall-shrub
ph. Quga					
	Rhart/Mumol		S47	93- 94	Steep rock-ledges & screes
	Hodu/Feth		S34	93- 94	Steep-ravines & fine-scrree slopes
	Hodu/RIBE		S35	93- 94	Steep moving-screes
		Mumol/Mela	G54	93- 94	Warm dry screes southerly
Psme/Syorl			S51	90- 94	Streams & floodplains, C channel
ph. Cagel		Sadr/Caca	C99	79- 93	Steep rocky northerly shallow sedimentary
	Ruid/Hepa2		S49	92- 93	Very-steep screes & crevices
		Diin/Caca	S32	92- 93	Steep canyon streamside
	Amal-Pavi/Viam		S5	91- 92	Coarse deep well-drained
	Pavi-Syorl/Eltr		S37	91- 92	Steep slopes rocky breaks in Quga-shrubland
	Quga-Pavi/Feth		S44	91- 92	Lower-slopes & benches, deep clay well-drained
	Pefl/Feth		S39	- 92	Floodplains & wet-screes, just above SALI-riparian
Pifl/Feth			C61	90- 91	Exposed ridgetops & ledges
		Caaq1/Caaq	G28	90- 91	Springs & seeps
Potrl/Syorl			D18	83- 90	Benches & slopes, well-drained
		Swse/Diin	S63	89- 90	Streamside, relatively dry well-drained
		Sage-SALI/Caca	S52	- 90	Riverine overflow-in-spring mod.well-drained
	Putr-Artrv/Feid		S40	(80- 89)	Steep southerly well-drained rocky sandy
Pipo/Feid			C72	87- 88	Sandy well-drained gentle (rare)
Psme/Arpa3			C87	72- 87	Steep mid- to lower-slopes, sedimentary
	Swse/Riin		S64	86- 87	Coarse-scrree
	Acgl/Swse		S1	86- 87	Coarse-scrree moist protected
Pipo/Quga			C79	78- 86	Dry shallow to deep, loamy sandstone southerly
		Alint/Swse	S2	85- 86	Dry streamside lower-elevations well-drained
Pipo/Arpa3			C65	72- 85	Warm dry southerly
	AMEL/Syorl-Artr		S4	75- 85	Snow-accumulation mod-deep mod-well-drained
	ph. Feth				Deeper exposed upper-elevations
	Syorl/Feth		S65	84- 85	Mod.steep southerly non-rocky subirrigated
Pied-Juos/Artr			W4	(60- 80)	Shallow sandy sandstone
		Pipu/Amal-Swse	C44	66- 79	Streamside & lower-benches, A & B channels
		Poan3/Saex-Befo	D5	(65- 78)	Streambanks & floodplains
Juos/Orhy			W8	(60- 73)	Lower-elevations gravelly shale
Juos/Mafr			W8	71- 72	Hot dry southerly (rare)
		Poan3/Alint-Swse	D3	71- 72	Streambanks & floodplains, mod.well-drained
Juos-Pied/Rosp			W10	(55- 71)	Lower-elevations shallow sedimentary
	Pera2-Syorl/Mare		S39	- 71	Warm dry gentle shallow
	Quga-Pavi/Pamy		S45	64- 65	Mod.steep bottoms & lower-slopes
	ph. Swse				

PLANT ASSOCIATIONS				DESCRIBED FROM OTHER AREAS			
FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	From	Elev.	Distinguishing Features
Pienl/Vace				C40	n UT	93-111	Lower-slope cold-air-drain non-calcar. rocky
Abla/Mare				C9	s UT	90-100	Mod.steep lower- to mid-slopes cool dry
Pico/Vace				C58	n UT	83-100	Lower-slope cold-air-drain dry non-calcareous
			Alint-Begl/Caaq	nc CO	- 98		Marshy-pond-margins subalpine
Psme/Cele				C90	UT-ID	63- 94	Dry very-exposed shallow rocky calcareous
Abco-Psme/Juco				C5	s UT	74- 92	Mod.steep northerly gravelly
Potrl/Sara				D18	UT	80- 90	Mid- to upper-slopes sedimentary
Pipo/Arno				C65	s UT	80- 90	Treeline lower-slope/benches shallow colluvial
Pipu-Psme/Juco				C48	UT	78- 88	Warm mid-/lower-slope calcar. alluv./colluvial
	Artrw-Syorl/Leci?			S18	nw CO	60- 86	Gentle mod-deep lower-slopes
		Sawo/Caut		S59	w WY	66- 86	Wet alluvial meadows & seeps sandstones
		Sawo/Dece		S59	w WY	-	Lower-toeslopes & benches coarse/fine-loamy
		Sawo/Frvi		G60	w WY	62- 86	Benches & flats, coarse-loamy/fine-loamy
		Cami4/Dece		G21	w WY	63- 86	Gentle alluvial high-water poorly-drained
Abco-Psme/Arpa3				C2	s UT	81- 85	Gentle benches & midslopes sedimentary
		Casi/Dece		G28	w WY	58- 84	Broad-meadows, seeps, & terraces, alluvial wet
		Pefl/Dece		S38	w WY	65- 83	Valley bottoms, loamy alluvial sedimentary
		Sawo/Caca		S58	e ID	-	Clayey riparian terraces & benches
		Sawo/Caaq		S59	w WY	64- 83	Alluvial wet meadows & seeps sedimentary deep
Abco-Psme/Phma				C5	UT	75-	Mod.steep northerly lower- to mid-slopes
Pipo/Cele				C69	s UT	61- 81	Treeline lower-slope/bench sediment. gravelly
Psme/Amal				C85	UT-ID	54- 79	Steep northerly warm moist lower-/mid-slopes
		Sabol-SALI/Caut		S50	w WY	59- 78	Alluvial gentle benches & terraces
		Sabol-SALI/Caca		S50	w WY	61- 75	Gentle slopes & benches, streamside
		Saex-SALI/Caca-Eqar		S52	w WY	- 71	Alluvial streamside fine-loamy no-deposition
Abco-Psme/Amal				C1	n UT	54- 70	Steep northerly lower-/mid-slopes & benches
		Salu/Eqar		S56	e ID	- 70	Within Sabol-shrubland, alluvial terraces
		Sage/Popa		S54	e ID	- 67	Broad valleys & benches, fine/clayey wet

KEY TO THE PLANT ASSOCIATIONS OF THE SAN JUAN NATIONAL FOREST, COLORADO
(Please see instructions at beginning of keys for explanation of how to use this key)

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	Elev.	Distinguishing Features
		Saren/Acro		F12	(118-136)	Moist cold snow-accumulation gentle gravelly
		Komy/Trna		G51	115-133	Fellfields rocky thin
		Cael/Acro		G18	128-130	Moist to dry "grass"land, mod.deep
		Cani/JUNC		G23	116-130	Alpine depressions & late-snowbanks, peaty-soils
			Caco2/Cale1	F5	116-130	Streambanks, seeps, & springs, snow-accumulation
		Dece/Acro		G31	(119-129)	Gentle lower-slopes mod-deep loamy protected
			Sag11-SALI/CARE	S55	(128-129)	High-subalpine/alpine wet poorly-drained
		Trpa/Acro		F19	(127-128)	Mod.deep sandy-loam rocky gentle snow-accumulation
		Acro/Bibi2		F1	(118-128)	Alpine slopes protected mod-shallow sandy-loam rocky
		Acro/Poar2		F2	-	Mod.moist meadow
		Orba/Saar-Sede		F8	-	Windy ridges
			Casc2/Cale1	G26	(116-125)	Marshes & streambanks, below-snowbanks peaty-soils
		Komy/Acro-Caru		G50	-123	Alpine "grass"land mod-deep well-drained gentle
			Sag11-Sabrl/Dece	S55	(114-123)	High-subalpine/alpine well-drained sandy-loam
			Saphp/Casc2	S57	(107-123)	Flat seeps & alpine-snowmelt-bogs
		Cael/Trda		G19	-122	Moderate-slopes protected
			Cale1/Clrh	F4	(117-118)	Marshes & streambanks, near-treeline
		Acro/TRIF-Dece		F3	(-117)	Steep rocky solifluction snow-accumulation protected
Abla-Pien1/Vamy				C30	86-118	Middle-elevations all-slopes subalpine c.c.
ph. Popul					99-118	Higher elevations
Pien1/Vasc				C41	112-118	Cool dry all-slopes
ph. Popul						Moister
Abla-Pien1/moss				C21	98-115	Well-drained rocky steep upper-slopes
			Abla-Pien1/Meci	C20	90-113	Streambanks & seeps, deep gentle
Pien1/moss				C38	99-110	Steep moist warm sparse
Abla-Pien1/Juco				C19	99-108	Warm dry
Abla-Pien1/RIBE				C24	-105	Cold upper-elevations loamy patchy sparse
			Elpa/CARE	G36	-	Wet meadows, water at surface
Abla-Pien1/Rupa				C25	88-105	Warm lower-elevations northerly limestones/volcanics
ph. Vasc						Belt just above ph. Rupa
Psme/Arad-Juco				C86	92-104	Rocky gentle slopes
Potrl/Cagel				D11	95-104	Loamy cool moist
Abla-Pien1/Erex				C17	90-102	Gentle upper-slopes lower-elevations
Pipo-Psme/Mumol				C75	75-102	Mod.shallow exposed ridge/bench open-canopy granite
Abla-Pien1/Libo				C18	87-100	Lower-elevations steep cool moist slopes, Psme-seral
ph. Vasc						Belt just above ph. Libo
Potrl/Syorl				D18	90- 98	Benches & slopes, well-drained
Potrl/Vete				D20	95- 98	Wet poorly-drained pockets clay
Potrl/LIGU				D15	90- 97	Deep poorly-drained loamy non-rocky moist
Pipo/Pied-Quga				C77	73- 95	Very-dry hot mod-low-elevations southerly
Quga/Syorl				S45	75- 95	Cool moist mod-deep well-drained c.c.
Pipu/POA				C49	(88- 93)	Deep alluvial
Psme/Quga				C96	71- 93	Moist slopes & ridges, lower-elevations loams
ph. Fearl						Higher-elevations drier
Abco-Psme/Syorl				C7	69- 92	Warm northerly slopes rocky
Abco-Psme/Acgl				C1	82- 92	Lower slopes & canyons, alluvial benches
			ph. Alint			
Abco-Psme/Erex				C3	80- 91	All-slopes & benches, rolling terrain
Abla/Thfel				C10	- 91	Warm deep Potrl-seral
			Poan3-Pien1/Diin	D4	82- 91	Streambanks & lower-benches, mod-well-drained
Abco-Psme/Vamy				C8	85- 90	Steep cold northerly upper-elevations
Psme/Fearl				C91	- 89	Steep cool southerly mid- to upper-slopes
Abco-Pifl/Fearl				C4	- 88	Southerly ridges & upper slopes
Abco-Psme/sparse				C7	- 87	Cool steep slopes rocky
Pipo/Bogr				C66	86- 87	Lower-elevations hot dry open-canopy
Pipo-JUNI/Bogr				C67	-	Shallow
Pipo/Scsc				C82	59- 86	Mesas & slopes, sandy
			Pipu/Amal-Swse	C44	77- 86	Streambanks & lower-benches, A & B channels
Abco-Psme/Quga				C6	81- 85	All-slopes & benches, lower-elevations
Abla-Pien1/Caro3				C16	81-	Screens & gravels, sparse
Pipu-Psme/Fearl				C47	83- 84	Warm dry upper-slopes
Pipu-Psme/Mare				C49	82- 83	Gentle lower slopes
Pipu-Psme/Libo				C48	80- 82	Protected slopes
Pipo/Quga				C79	65- 81	Dry loamy sandstones southerly
ph. Syorl						Moister cooler upper-elevations Potrl-seral
Pied-Juos/Artr				W4	(60- 80)	Shallow sandy sandstone
ph. Bogr						
Pipu-Psme/Cafo				C46	78- 79	Benches & lower-slopes
Pied/Quga				W9	(68- 79)	Middle-elevations steep deep well-drained
Juos/Orhy				W8	(60- 72)	Lower-elevations gravelly shale
	Quga/Amut			S43	(80- 86)	Exposed ridges & mesas, moist deep fine-textured
	Quga/Amal			S42	80- 86	Upper- to mid-slopes, coarse/very-coarse
	ph. Mare					Shallower cooler

PLANT ASSOCIATIONS DESCRIBED FROM OTHER AREAS

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	From	Elev.	Distinguishing Features
Pien1-Psme/Juco				C37	n NM	105-108	Gentle upper- to mid-slopes rocky sparse
Abla/Mare				C9	s UT	90-100	Mod.steep lower- to mid-slopes cool dry
			Alint-Begl/Caaq	S2	nc CO	- 98	Marshy-pond-margins subalpine
Abco-Psme/Juco				C5	s UT	74- 92	Mod.steep northerly gravelly
Potrl/Sara				D18	UT	80- 90	Mid- to upper-slopes sedimentary
Pipo/Arno				C65	s UT	80- 90	Treeline lower-slope/benches shallow colluvial
Pipu-Psme/Juco				C48	UT	78- 88	Warm mid-/lower-slope calcar. alluv./colluvial
			Sawo/Caut	S59	w WY	66- 86	Wet alluvial meadows & seeps sandstones
			Sawo/Dece	S59	w WY	-	Lower-toeslopes & benches coarse/fine-loamy
			Sawo/Frvi	S60	w WY	62- 86	Benches & flats, coarse-loamy/fine-loamy
			Cami4/Dece	G21	w WY	63- 86	Gentle alluvial high-water poorly-drained
Abco-Psme/Arpa3				C2	s UT	81- 85	Gentle benches & midslopes sedimentary
			Casi/Dece	G28	w WY	58- 84	Broad-meadows, seeps, & terraces, alluvial wet
Pied/Arno				W4	n NM	- 83	Lower-slopes & benches frigid-soils
			Pefl/Dece	S38	w WY	65- 83	Valley bottoms, loamy alluvial sedimentary
			Sawo/Caca	S58	e ID	-	Clayey riparian terraces & benches
			Sawo/Caaq	S59	w WY	64- 83	Alluvial wet meadows & seeps sedimentary deep
Abco-Psme/Phma				C5	UT	75-	Mod.steep northerly lower- to mid-slopes
Pipo/Cele				C69	s UT	61- 81	Treeline lower-slope/bench sediment. gravelly
Psme/Amal				C85	UT-ID	54- 79	Steep northerly warm moist lower-/mid-slopes
			Sabol-SALI/Caut	S50	w WY	59- 78	Alluvial gentle benches & terraces
Pied-Juos/Cemo				W7	sw CO	- 76	Gentle fine-SL sandstone sparse closed-canopy
			Sabol-SALI/Caca	S50	w WY	61- 75	Gentle slopes & benches, streambanks
	Artrt/Bogr			S12	n NM	59- 72	Deep silty/clay-loam alluvial-colluvial
	ph. Hija						
			Saex-SALI/Caca-Eqar	S52	w WY	- 71	Alluvial streambanks fine-loamy no-deposition
Abco-Psme/Amal				C1	n UT	54- 70	Steep northerly lower-/mid-slopes & benches
	Artr/Spocr			S21	nw NM	- 70	Alluvial shallow alkaline
			Salu/Eqar	S56	e ID	- 70	Within Sabol-shrubland, alluvial terraces
			Sage/Popa	S54	e ID	- 67	Broad valleys & benches, fine/clayey wet

KEY TO THE PLANT ASSOCIATIONS OF THE RIO GRANDE NATIONAL FOREST, COLORADO
(Please see instructions at beginning of keys for explanation of how to use this key)

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	Elev.	Distinguishing Features
		Trpa/Dece		F20	106-129	High-meadows & turfs, rocky gentle
Abla-Pienl/Vamy				C30	98-118	All-slopes uplands subalpine characteristic <u>c.c.</u>
ph. Popul					99-118	Moister higher-elevations
Pienl/Vamy				C40	117-118	Northerly cold drier
ph. Popul						Moister
Pienl/moss				C38	-118	Steep moist warm sparse
Piar/Feth				C53	106-116	Shallow cold timberline patchy open-canopy
Pienl/Feth				C36	112-114	Steep warm upper-slopes thin rocky
Abla-Pienl/Erex				C17	92-105	Gentle upper-slopes lower-elevations
Psme/Arad-Juco				C86	92-104	Rocky gentle slopes well-drained
Abla-Pienl/Rupa				C25	85-103	Warm lower-elevations northerly limestone/volcanics
ph. Vasc						Belt just above ph. Rupa
Abla-Pienl/Juco				C17	-101	Warm dry
Piar/Fearl				C52	99-100	Cold dry rocky lower-elevations patchy open-canopy
			Dece/Calel	G32	(100-101)	Subalpine meadows, alluvial poorly-drained
				G46	(97-100)	Gentle deep rocky
Pipo/Fearl		Feth/Fearl		C71	86- 97	Cool moist gentle slopes relatively-deep <u>c.c.</u>
ph. Dapal						Gentle slopes
ph. Bogr						Lower-elevations warmer
		Mufil/Arfrl		G53	92- 96	Steep meadows rocky southerly
		Bogr/Mufil		G10	84- 96	Flat to gentle benches
		ph. Chna				
		ph. Chpa				
Abla-Pienl/Libo				C18	- 95	Steep cool moist slopes lower-elevations Psme-seral
ph. Vasc						Belt just above ph. Libo
Pico/Arad				C54	-	Warm dry very-well-drained granitic lower-elevations
Pipu-Psme/Libo				C48	87- 95	Protected slopes, steep cool moist
Pipo-Psme/Mumol				C75	75- 95	Mod.deep exposed ridges & benches open-canopy patchy
		Mumol/Fearl		G54	75- 95	Dry deep fine-textured rocky
		Mumol/Bltr		G53	-	Parks in Pipo-forest
Pied/Bogr				W5	83- 94	Higher-elevations rocky slopes hot dry
Pipu/POA				C49	(88- 93)	Deep alluvial
Abla-Pienl/Caro3				C16	81-	Scree & gravels, sparse
Abco-Psme/Fearl				C2	- 92	Warm ridges & gentle-slopes
Abco-Psme/Acgl			ph. Alint	C1	82- 92	Lower-slopes & canyons, cool moist protected
						Stream-sides
Pipu-Psme/Arad				C45	91- 92	Warm dry southerly lower-slopes
Psme/Fearl				C91	89- 92	Cool steep southerly mid- to upper-slopes
		Fearl/Mumol		G40	90- 92	Meadows deep gravelly
		Fearl/Cahel		G40	-	Deep loamy grassland moist poorly-drained
Psme/Phmo				C95	88- 90	Steep northerly lower-slopes cold-air drains
Psme/Quga				C96	71- 90	Moist cool slopes & ridges lower-elevations loamy
ph. Fearl						Higher-elevations drier
		Bogr/Atca		G5	82- 90	Steep rocky
Pipu-Psme/Fearl				C47	83- 89	Warm dry upper-slopes
Abco-Psme/Arad				C2	- 88	Ridgetops, well-drained
Abco-Psme/Hodu				C4	87- 88	Cool scree slopes
Psme/Cemo				C91	87- 88	Warm dry southerly upper- to mid-slopes
Pied-Jumo/Cemo				W6	-	Cobbly-rocky middle- to upper-slopes
	Atca/Stcol			S26	- 88	Upper-slopes & mesa-sides, southerly
			Judr/CARE	G49	84- 88	Low wet meadows
Pipu-Psme/Erex				C47	86- 87	All-slopes deep moist
			Pipu/Alint	C44	85- 86	Stream-sides, A & B channels
Pipo/Scsc				C82	59- 86	Mod.shallow mod.exposed ridges & benches open-canopy

PLANT ASSOCIATIONS DESCRIBED FROM OTHER AREAS

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	From	Elev.	Distinguishing Features
Pienl-Psme/Juco				C37	n NM	105-108	Gentle upper- to mid-slopes rocky sparse
Abla/Mare				C9	s UT	90-100	Mod.steep lower- to mid-slopes cool dry
			Alint-Begl/Caaq	S2	nc CO	- 98	Marshy-pond-margins subalpine
Abco-Psme/Juco				C5	s UT	74- 92	Mod.steep northerly gravelly
Potrl/Sara				D18	UT	80- 90	Mid- to upper-slopes sedimentary
Pipo/Arno				C65	s UT	80- 90	Treeline lower-slope/benches shallow colluvial
		Feid/Cahel		G40	se MT	-	Parks in Pipo-forest loamy gentle
		Stcol/Cahel		G69	MT-SD	-	Parks in Pipo-forest loamy
		ph. Sede				-	Upper-elevations sandier
Pipu-Psme/Juco				C48	UT	78- 88	Warm mid-/lower-slope calcar. alluv./colluvial
	Cemo/Feid			S31	"WY"	-	Shallow rocky northerly moist
	Cemo/Rosp			S31	"WY"	55- 88	Mod.steep shallow rocky southerly
			Sawo/Caut	S59	w WY	66- 86	Wet alluvial meadows & seeps sandstones
			Sawo/Dece	S59	w WY	-	Lower-toeslopes & benches coarse/fine-loamy
			Sawo/Frvi	S60	w WY	62- 86	Benches & flats, coarse-loamy/fine-loamy
			Cami4/Dece	G21	w WY	63- 86	Gentle alluvial high-water poorly-drained
Pied/Arno			Casi/Dece	G28	w WY	58- 84	Broad-meadows, seeps, & terraces, alluvial wet
			Pefl/Dece	S38	w WY	65- 83	Valley bottoms, loamy alluvial sedimentary
			Sawo/Caca	S58	e ID	-	Clayey riparian terraces & benches
			Sawo/Caaq	S59	w WY	64- 83	Alluvial wet meadows & seeps sedimentary deep
Abco-Psme/Phma				C5	UT	75-	Mod.steep northerly lower- to mid-slopes
Psme/Amal				C85	UT-ID	54- 79	Steep northerly warm moist lower-/mid-slopes
			Sabol-SALI/Caut	S50	w WY	59- 78	Alluvial gently benches & terraces
			Sabol-SALI/Caca	S50	w WY	61- 75	Gentle slopes & benches, stream-sides
			Salu/Eqar	S56	e ID	-	Within Sabol-shrubland, alluvial terraces
			Sage/Popa	S54	e ID	-	Broad valleys & benches, fine/clayey wet
Pied-Jumo/Stne				W11	NM	68- 73	Gentle southerly upper-slopes less-rocky deep
	Artrt/Bogr			S12	n NM	59- 72	Deep silty/clay-loam alluvial-colluvial
	ph. Hija						
Abco-Psme/Amal				C1	n UT	54- 70	Steep northerly lower-/mid-slopes & benches
	Artr/Spcer			S21	nw NM	- 70	Alluvial shallow alkaline
		Bogr/Hija		G9	nw NM	61- 69	Alluvial-flats/mesas, mod.deep SICL/L alkaline
		ph. Boer					Stony CL, less-Bogr
		Hija/Spai		G48	nw NM	57- 68	Colluvial-alluvial mod.deep alkaline gentle
	Eula/Hija			S34	NM-UT	57- 67	Alluvial flats & mesas mod.deep alkaline
	Save2-Atco/Eltr			S60	sw ND	-	Steep upland-slope no-carbonates low-organic
	Save2/Rosp			S62	se MT	-	Benches shales mod-steep slopes southerly
	Arca3/Syoc-Elsm			S9	sw ND	-	Alluvial terraces/lower-slopes loamy alkaline
	ph. Bogr						More-clay
		SUAE/Saru		F16	MT-SD	-	Flats v.saline v.alkaline permanent-wet salty
Jumo/Elsm				W8	AZ-NM	- 66	Rolling hills & mesas, alkaline
		Spai/Bogr		G64	nw NM	59- 62	Alluvial flats deep alkaline

KEY TO THE PLANT ASSOCIATIONS OF THE PIKE and SAN ISABEL NATIONAL FOREST, COLORADO
(Please see instructions at beginning of keys for explanation of how to use this key)

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	Elev.	Distinguishing Features
		Trda/Elsc		F17	117-133	Talus-screes & ridgetops, windy exposed
		Trda/Caru		F17	125-133	Rocky slopes mod.exposed
		Komy/Trna		G51	115-133	Fellfields rocky thin
		Dece/Acro		G31	(113-129)	Gentle lower-slopes mod.deep loamy protected <u>c.c.</u>
		Komy/Acro-Caru		G50	116-126	Alpine "grass"land mod.deep well-drained gentle <u>c.c.</u>
		Vaca2/Cebe2		F21	116-126	Steep screes gravelly
		Komy/Trda		G51	116-125	Fellfields & turfs, rocky thin
			Saphp/Caaq	S57	95-125	Subalpine-alpine streambank/bog poorly-drained v.wet
			ph. Dece		(-125)	Higher elevations
			Sag11-SALI/CARE	S55	114-122	High-subalpine/alpine wet poorly-drained
Abla-Pien1/Sag11				C26	117-123	Treeline moist krummholz & just-below, open-canopy
Abla-Pien1/RIBE				C24	119-122	Cold upper-elevations loamy patchy closed-canopy
Piar/Trda				C54	114-121	Closed-canopy sandy just-below-treeline north-part
Pien1/Vamy				C40	109-120	Northerly cold drier
ph. Popul						Moister higher-elevations
Abla-Pien1/Vamy				C30	105-117	All-slopes subalpine characteristic <u>c.c.</u>
ph. Popul					99-117	Higher-elevations moister
Piar/Feth				C53	110-	Shallow cold timberline patchy open-canopy
Piar/Rimo				C54	115-116	Scree slopes open-canopy
Pien1/moss				C37	93-113	Steep moist warm sparse
			Abla-Pien1/Meci	C20	101-108	Streamsides & seeps gentle deep
			Dece/Cale1	G32	(98-103)	Subalpine meadows alluvial poorly-drained
Piar/Fear1				C52	93-101	Cold dry rocky lower-subalpine patchy open-canopy
Abla-Pien1/Erex				C19	90-101	Gentle upper-slopes lower-elevations
Abla-Pien1/Libo				C18	87-100	Lower-elevations steep moist cool slopes Psme-seral
ph. Vasc						Belt just above ph. Libo, (Pico-seral)
Pico/Arad				C54	-	Warm dry well-drained granite lower-elevations
		Feth/Dapal		G45	(97-100)	Deep rocky canyonsides & well-drained slopes
		Dapal/Cahe1		G30	91-100	Gentle lower-slopes mod.deep loamy protected
		Feth/Fear1		G46	-	Gentle deep rocky
Pipo/Fear1				C71	77- 98	Cool moist gentle rel.deep upper-elevations <u>c.c.</u>
ph. Dapal						Gentler slopes
Pif1/Juco				C61	96- 97	Warm dry windswept ridges
Pipo/Quga				C79	72- 97	Dry mod.deep loamy sandstones southerly
Psme/Fear1				C91	95- 96	Cool steep southerly mid- to upper-slopes
		Fear1/Mumol		G40	78- 96	Meadows deep gravelly
		Mumol/Fear1		G54	(75- 95)	Deep dry fine-textured rocky
		Mumol/Bltr		G53	-	Parks in Pipo-forest
Pied/Bogr				W5	(83- 94)	Higher-elevations rocky slopes hot dry
Psme/Cemo				C91	89- 94	Warm dry southerly upper- to mid-slopes
Pipu/P0A				C49	(88- 93)	Deep alluvial
Abla-Pien1/Caro3				C16	81-	Screes & gravels, sparse
Psme/Arad-Juco				C86	76- 93	Rocky gentle slopes lower- to middle-elevations
Psme/Jaam				C92	83- 92	Steep/v.steep rocky northerly shallow bouldery
Abco-Psme/Acg1				C1	82- 92	Lower-slopes & canyons moist cool
			ph. Alint			Streambanks
Abco-Psme/Erex				C3	80- 91	All-slopes & benches, lower-elevations
Pipu-Psme/Erex				C47	86- 91	All-slopes deep moist
Potrl/LlGU				D15	90- 91	Deep poorly-drained loam non-rocky moist
Pipo-Psme/Mumol				C75	83- 91	Mod.shallo ridge/bench mod-expos. granit open-canopy
ph. Cefe						Lower-elevations
Abco-Psme/Vamy				C8	85- 90	Steep cold northerly upper-elevations
Abco-Psme/Syor1				C7	85- 90	Warm northerly slopes, limestone/volcanics
Psme/Phmo				C95	88- 90	Steep northerly lower-/mid-slopes cold-air drains
Pipo/Arad				C64	72- 90	Dry well-drained warm slopes
	Cemo/Mumol			S31	79- 86	Southerly steep lower-slopes
Psme/Quga				C96	- 80	Moist cool slopes & ridges lower-elevations loams
ph. Fear1						Higher-elevations drier
Pipo/Cemo				C70	58- 78	Steep dry rocky slopes lower-elevations southerly
Pipo/Cahe1				C68	75- 76	Lower-elevations rocky ridges & gentle slopes sandy
Pipo/Caro3				C69	57- 68	Gentle slopes very-dry very-well-drained granite
Pipo-JUNI/Bogr				C67	-	Shallow hot dry
Pied-Jumo/Cemo				W6	-	Cobbly-rocky steep mid- to upper-slopes
Jumo/Bogr				W6	(59-66)	Lower-elevations shallow loams
Jumo/Bocu				W5	-	Shallow rocky breaks
			Bogr/STIP	G11	(53-54)	Well-drained ridges & alluvial terraces

PLANT ASSOCIATIONS DESCRIBED FROM OTHER AREAS

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	From	Elev.	Distinguishing Features
Pien1/Vace				C40	n UT	93-111	Lower-slope cold-air-drain non-calcar. rocky
Pico/Vace				C58	n UT	83-100	Lower-slope cold-air-drain dry non-calcareous
			Pef1/Dece	S38	w WY	-	Valley bottoms, loamy alluvial sedimentary
			Sawo/Caca	S58	e ID	-	Clayey riparian terraces & benches
			Sawo/Caaq	S59	w WY	-	Alluvial wet meadows & seeps sedimentary deep
			Sabol-SALI/Caut	S50	w WY	-	Alluvial gentle benches & terraces
			Sabol-SALI/Caca	S50	w WY	-	Gentle slopes & benches, streamsides
			Salu/Eqar	S56	e ID	-	Within Sabol-shrubland, alluvial terraces
			Sage/Popa	S54	e ID	-	Broad valleys & benches, fine/clayey wet
Pien1-Psme/Juco				C37	n NM	105-108	Gentle upper- to mid-slopes rocky sparse
Abla/Mare				C9	s UT	90-100	Mod.steep lower- to mid-slopes cool dry
			Alint-Begl/Caaq	S2	nc CO	- 98	Marshy-pond-margins subalpine
Abco-Psme/Juco				C5	s UT	74- 92	Mod.steep northerly gravelly
Pipu-Psme/Juco				C48	UT	78- 88	Warm mid-/lower-slope calcar. alluv./colluvial
	Cemo/Feid			S31	"WY"	-	Shallow rocky northerly moist
	Cemo/Rosp			S31	"WY"	55- 88	Mod.steep shallow rocky southerly
Pied/Arno				W4	n NM	- 83	Lower-slopes & benches frigid-soils
Abco-Psme/Phma				C5	UT	75-	Mod.steep northerly lower- to mid-slopes
Psme/Amal				C85	UT-ID	54- 79	Steep northerly warm moist lower-/mid-slopes
		Atco-Artw/Rosp		S27	CO-WY	60- 76	Clayey badlands mod.steep southerly
Pied-Jumo/Stne				W11	NM	68- 73	Gentle southerly upper-slopes less-rocky deep
		Arttr/Bogr		S12	n NM	59- 72	Deep silty/clay-loam alluvial-colluvial
		ph. Hija					
Abco-Psme/Amal				C1	n UT	54- 70	Steep northerly lower-/mid-slopes & benches
	Quga/Cahe1			S44	ec CO	- 70	Upper-slopes & ridges, oak-savanna, east-slope
	Artr/Spcr			S21	nw NM	- 70	Alluvial shallow alkaline
		Bogr/Hija		G9	nw NM	61- 69	Alluvial-flats/mesas, mod.deep SICL/L alkaline
		ph. Boer					Stony CL, less-Bogr
		Hija/Spai		G48	nw NM	57- 68	Colluvial-alluvial mod.deep alkaline gentle
	Eula/Hija			S34	NM-UT	57- 67	Alluvial flats & mesas mod.deep alkaline
Jumo/Elsm				W8	AZ-NM	- 66	Rolling hills & mesas, alkaline
		Spai/Bogr		G64	nw NM	59- 62	Alluvial flats deep alkaline
	Cemo-Rhart/Ange			S29	ne CO	57- 62	Gentle rocky well-drain stony/cobbly mod.deep
		Feid/Cahe1		G40	se MT	-	Parks in Pipo-forest loamy gentle
		Stcol/Cahe1		G69	MT-SD	-	Parks in Pipo-forest loamy
		ph. Sede				-	Upper-elevations sandier
			Posa/Syoc-Saex	D7	ne CO	- 40	Plains floodplains major-rivers

KEY TO THE PLANT ASSOCIATIONS OF THE PIKE and SAN ISABEL NATIONAL FOREST, COLORADO
(Please see instructions at beginning of keys for explanation of how to use this key)

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	Elev.	Distinguishing Features
		Trda/Elsc		F17	117-133	Talus-screes & ridgetops, windy exposed
		Trda/Caru		F17	125-133	Rocky slopes mod.exposed
		Komy/Trna		G51	115-133	Fellfields rocky thin
		Dece/Acro		G31	(113-129)	Gentle lower-slopes mod.deep loamy protected <u>c.c.</u>
		Komy/Acro-Caru		G50	116-126	Alpine "grass"land mod.deep well-drained gentle <u>c.c.</u>
		Vaca2/Cebe2		F21	116-126	Steep screes gravelly
		Komy/Trda		G51	116-125	Fellfields & turfs, rocky thin
			Saphp/Caaq	S57	95-125	Subalpine-alpine streambank/bog poorly-drained v.wet
			ph. Dece		(-125)	Higher elevations
			Sag11-SALI/CARE	S55	114-122	High-subalpine/alpine wet poorly-drained
Abla-Pien1/Sag11				C26	117-123	Treeline moist krummholz & just-below, open-canopy
Abla-Pien1/RIBE				C24	119-122	Cold upper-elevations loamy patchy closed-canopy
Piar/Trda				C54	114-121	Closed-canopy sandy just-below-treeline north-part
Pien1/Vamy				C40	109-120	Northerly cold drier
ph. Popul						Moister higher-elevations
Abla-Pien1/Vamy				C30	105-117	All-slopes subalpine characteristic <u>c.c.</u>
ph. Popul					99-117	Higher-elevations moister
Piar/Feth				C53	110-	Shallow cold timberline patchy open-canopy
Piar/Rimo				C54	115-116	Scree slopes open-canopy
Pien1/moss				C37	93-113	Steep moist warm sparse
			Abla-Pien1/Meci	C20	101-108	Streamsides & seeps gentle deep
			Dece/Cale1	G32	(98-103)	Subalpine meadows alluvial poorly-drained
				C52	93-101	Cold dry rocky lower-subalpine patchy open-canopy
Piar/Fear1				C19	90-101	Gentle upper-slopes lower-elevations
Abla-Pien1/Erex				C18	87-100	Lower-elevations steep moist cool slopes Psme-seral
Abla-Pien1/Libo						Belt just above ph. Libo, (Pico-seral)
ph. Vasc						
Pico/Arad				C54	-	Warm dry well-drained granite lower-elevations
		Feth/Dapal		G45	(97-100)	Deep rocky canyonsides & well-drained slopes
		Dapal/Cahel		G30	91-100	Gentle lower-slopes mod.deep loamy protected
		Feth/Fear1		G46	-	Gentle deep rocky
Pipo/Fear1				C71	77- 98	Cool moist gentle rel.deep upper-elevations <u>c.c.</u>
ph. Dapal						Gentler slopes
Pif1/Juco				C61	96- 97	Warm dry windswept ridges
Pipo/Quga				C79	72- 97	Dry mod.deep loamy sandstones southerly
Psme/Fear1				C91	95- 96	Cool steep southerly mid- to upper-slopes
		Fear1/Mumol		G40	78- 96	Meadows deep gravelly
		Mumol/Fear1		G54	(75- 95)	Deep dry fine-textured rocky
		Mumol/Bltr		G53	-	Parks in Pipo-forest
Pied/Bogr				W5	(83- 94)	Higher-elevations rocky slopes hot dry
Psme/Cemo				C91	89- 94	Warm dry southerly upper- to mid-slopes
Pipu/P0A				C49	(88- 93)	Deep alluvial
Abla-Pien1/Caro3				C16	81-	Screes & gravels, sparse
Psme/Arad-Juco				C86	76- 93	Rocky gentle slopes lower- to middle-elevations
Psme/Jaam				C92	83- 92	Steep/v.steep rocky northerly shallow bouldery
Abco-Psme/Acgl				C1	82- 92	Lower-slopes & canyons moist cool
			ph. Alint			Streambanks
Abco-Psme/Erex				C3	80- 91	All-slopes & benches, lower-elevations
Pipu-Psme/Erex				C47	86- 91	All-slopes deep moist
Potr1/L1GU				D15	90- 91	Deep poorly-drained loam non-rocky moist
Pipo-Psme/Mumol				C75	83- 91	Mod.shallo ridge/bench mod-expos. granit open-canopy
ph. Cefe						Lower-elevations
Abco-Psme/Vamy				C8	85- 90	Steep cold northerly upper-elevations
Abco-Psme/Syor1				C7	85- 90	Warm northerly slopes, limestone/volcanics
Psme/Phmo				C95	88- 90	Steep northerly lower-/mid-slopes cold-air drains
Pipo/Arad				C64	72- 90	Dry well-drained warm slopes
	Cemo/Mumol			S31	79- 86	Southerly steep lower-slopes
Psme/Quga				C96	- 80	Moist cool slopes & ridges lower-elevations loams
ph. Fear1						Higher-elevations drier
Pipo/Cemo				C70	58- 78	Steep dry rocky slopes lower-elevations southerly
Pipo/Cahel				C68	75- 76	Lower-elevations rocky ridges & gentle slopes sandy
Pipo/Caro3				C69	57- 68	Gentle slopes very-dry very-well-drained granite
Pipo-JUNI/Bogr				C67	-	Shallow hot dry
Pied-Jumo/Cemo				W6	-	Cobbly-rocky steep mid- to upper-slopes
Jumo/Bogr				W6	(59-66)	Lower-elevations shallow loams
Jumo/Bocu				W5	-	Shallow rocky breaks
			Bogr/STIP	G11	(53-54)	Well-drained ridges & alluvial terraces

PLANT ASSOCIATIONS DESCRIBED FROM OTHER AREAS

FORESTS	SHRUBLAND	GRASSLAND and FORBLAND	RIPARIAN	Page	From	Elev.	Distinguishing Features
Pien1/Vace				C40	n UT	93-111	Lower-slope cold-air-drain non-calcar. rocky
Pico/Vace				C58	n UT	83-100	Lower-slope cold-air-drain dry non-calcareous
			Pef1/Dece	S38	w WY	-	Valley bottoms, loamy alluvial sedimentary
			Sawo/Caca	S58	e ID	-	Clayey riparian terraces & benches
			Sawo/Caaq	S59	w WY	-	Alluvial wet meadows & seeps sedimentary deep
			Sabol-SALI/Caut	S50	w WY	-	Alluvial gentle benches & terraces
			Sabol-SALI/Caca	S50	w WY	-	Gentle slopes & benches, streamsides
			Salu/Eqar	S56	e ID	-	Within Sabol-shrubland, alluvial terraces
			Sage/Popa	S54	e ID	-	Broad valleys & benches, fine/clayey wet
Pien1-Psme/Juco				C37	n NM	105-108	Gentle upper- to mid-slopes rocky sparse
Abla/Mare				C9	s UT	90-100	Mod.steep lower- to mid-slopes cool dry
			Alint-Begl/Caaq	S2	nc CO	- 98	Marshy-pond-margins subalpine
Abco-Psme/Juco				C5	s UT	74- 92	Mod.steep northerly gravelly
Pipu-Psme/Juco				C48	UT	78- 88	Warm mid-/lower-slope calcar. alluv./colluvial
	Cemo/Feid			S31	"WY"	-	Shallow rocky northerly moist
	Cemo/Rosp			S31	"WY"	55- 88	Mod.steep shallow rocky southerly
Pied/Arno				W4	n NM	- 83	Lower-slopes & benches frigid-soils
Abco-Psme/Phma				C5	UT	75-	Mod.steep northerly lower- to mid-slopes
Psme/Amal				C85	UT-ID	54- 79	Steep northerly warm moist lower-/mid-slopes
	Atco-Artrw/Rosp			S27	CO-WY	60- 76	Clayey badlands mod.steep southerly
Pied-Jumo/Stne				W11	NM	68- 73	Gentle southerly upper-slopes less-rocky deep
	Artrt/Bogr			S12	n NM	59- 72	Deep silty/clay-loam alluvial-colluvial
	ph. Hija						
Abco-Psme/Amal				C1	n UT	54- 70	Steep northerly lower-/mid-slopes & benches
	Quga/Cahel			S44	ec CO	- 70	Upper-slopes & ridges, oak-savanna, east-slope
	Artr/Spqr			S21	nc NM	- 70	Alluvial shallow alkaline
		Bogr/Hija		G9	nw NM	61- 69	Alluvial-flats/mesas, mod.deep SiCL/L alkaline
		ph. Boer					Stony CL, less-Bogr
	Hija/Spai			G48	nw NM	57- 68	Colluvial-alluvial mod.deep alkaline gentle
				S34	NM-UT	57- 67	Alluvial flats & mesas mod.deep alkaline
Jumo/Elsm				W8	AZ-NM	- 66	Rolling hills & mesas, alkaline
		Spai/Bogr		G64	nw NM	59- 62	Alluvial flats deep alkaline
	Cemo-Rhart/Ange			S29	ne CO	57- 62	Gentle rocky well-drain stony/cobbly mod.deep
		Feid/Cahel		G40	se MT	-	Parks in Pipo-forest loamy gentle
		Stcol/Cahel		G69	MT-SD	-	Parks in Pipo-forest loamy
		ph. Sede					Upper-elevations sandier
			Posa/Syoc-Saex	D7	ne CO	- 40	Plains floodplains major-rivers

O. CONIFEROUS FORESTS

ABIES CONCOLOR SERIES (001)

00101

Abco-Psme/Acgl

Abies concolor-Pseudotsuga menziesii/Acer glabrum p.a.

= Abco/Acgl h.t. (Fitzhugh et al. 1983, De Velice et al. 1985, Youngblood and Mauk 1985)

= Abco/Gatr h.t. (De Velice et al. 1984) (see phase Alte)

Cool, moist canyons, steep slopes, all slope positions, streamsides, and uplands, rocky and stony soils, gentle n-facing mesa tops or e-s-w-facing canyon sideslopes, 7400-9900 ft. (or down streamsides at lower elevations).

d Abies concolor
d Pseudotsuga menziesii
s Populus tremuloides
a Pinus strobus
Picea engelmannii
a Picea pungens

Acer glabrum
Mahonia repens
Paxistima myrsinites
Quercus gambelii
Holodiscus dumosus
Symphoricarpos oreophilus
Juniperus communis
Amelanchier alnifolia
Clematis columbiana
Rosa woodsii

Erigeron eximius
Lathyrus arizonicus
Artemisia franserioides
Oreochrysum parryi
Thalictrum fendleri
Fragaria vesca
Smilacina amplexicaulis
Vicia americana

Bromus ciliatus
Carex rossii
Carex geyeri
Carex foenea

- San Juan NF, 8200-9200 ft. (Moir and Ludwig 1979, De Velice et al. 1985, Mathiasen et al. 1986)
- Rio Grande NF, 9200 ft. (De Velice et al. 1985)
- San Isabel NF, 8200-8600 ft. (De Velice et al. 1985)
- n New Mexico, 8200-9900 ft. (De Velice et al. 1985)
- sw New Mexico, 8100-9800 ft. (Fitzhugh et al. 1983)
- sc New Mexico, 8000-9500 ft. (Alexander et al. 1984)
- se Arizona-sw New Mexico, 8900-9200 ft. (De Velice and Ludwig 1983)
- s Utah, 7400-8400 ft. (Youngblood and Mauk 1985)

PHASES: 1. Mahonia repens conspicuous -- San Juan NF, n New Mexico (Moir and Ludwig 1979)

2. Holodiscus dumosus conspicuous and mixed with Acer glabrum and Ribes spp. -- sc New Mexico (Alexander et al. 1984)

3. Alnus incana spp. tenuifolia conspicuous on riparian sites, with Populus angustifolia, Juniperus scopulorum, Galium triflorum, Rudbeckia ampla, Equisetum arvense, and Smilacina stellata -- s Colorado (De Velice et al. 1985)

CC

00111

Abco-Psme/Amal

Abies concolor-Pseudotsuga menziesii/Amelanchier alnifolia p.a.

= Abco/Osch h.t. (Mauk and Henderson 1984)

Steep to very steep, northerly lower to middle slopes and streamside benches.

d Abies concolor	Amelanchier alnifolia
d-a Pseudotsuga menziesii	Paxistima myrsinites
s Populus tremuloides	Mahonia repens
a Picea engelmannii	
a Abies lasiocarpa	
Osmorhiza chilensis	Elymus glaucus

- n Utah, 5400-7000 ft. (Mauk and Henderson 1984)

ALSO SEE: - Psme/Amal
- Psme/Pamy
- Abco-Psme/Phma

[illegible]

00109 Abco-Psme/Arad

Abies concolor-Pseudotsuga menziesii/Arctostaphylos adenotricha p.a.

= Abco/Arctostaphylos uva-ursi h.t. (De Velice et al. 1985)

Ridgetops or occasionally lower slopes, moderate to steep, of all aspects, relatively dry, with low snow accumulations, 7870-9510 ft.

d <i>Abies concolor</i>	<i>Arctostaphylos adenotricha</i>
d <i>Pseudotsuga menziesii</i>	<i>Paxistima myrsinites</i>
s <i>Pinus ponderosa</i>	<i>Juniperus communis</i>
a <i>Pinus strobiformis</i>	
a <i>Populus tremuloides</i>	
<i>Fragaria virginiana</i>	<i>Koeleria macrantha</i>
	<i>Muhlenbergia montana</i>
	<i>Poa fendleriana</i>

- Rio Grande NF, 8800 ft. (De Velice et al. 1984)

- n New Mexico, 7800-9700 ft. (De Velice et al. 1985)

ALSO SEE: - Psme/Arad

[illegible]

00112 Abco-Psme/Arpa3

Abies concolor-Pseudotsuga menziesii/Arctostaphylos patula p.a.

= Abco/Arpa3 h.t. (Youngblood and Mauk 1985)

Gentle benches or midslopes, variety of aspects, mostly sedimentary (often limestone) substrates, large bare soil cover.

d Abies concolor	Arctostaphylos patula
d Pseudotsuga menziesii	Symphoricarpos oreophilus
s Pinus ponderosa	Mahonia repens
s Pinus flexilis	
a Picea pungens	
a Juniperus scopulorum	
	Carex rossii

- s Utah, 8100-8500 ft. (Youngblood and Mauk 1985)

ALSO SEE: - Psme/Cele
- Psme/Arpa3

- Pipo/Arpa3

Pseudocymopterus montanus
Achillea lanulosa
Senecio wootonii
Oreochrysum parryi

Poa fendleriana
Bromus canadensis
Koeleria cristata
Carex rossii

- Rio Grande NF, 9200 ft. (Moir and Ludwig 1979, De Velice et al. 1985, Mathiasen et al. 1986)
- n New Mexico, 8900-10200 ft. (De Velice et al. 1985)
- wc New Mexico, 8000-9200 ft. (Fitzhugh et al.)
- nc-ec Arizona

On drier sites, see also Pipo/Fearl and Pipo/Mumol.

PHASE: 1. *Danthonia parryi* conspicuous at lower elevations, with more *Quercus gambelii*, *Carex foenea*, and *Lathyrus* spp. -- n New Mexico, 8840 ft. (De Velice et al. 1985)

ALSO SEE: - Abco-Pifl/Fearl

CC
 00115 Abco-Pifl/Fearl

Abies concolor-*Pinus flexilis*/*Festuca arizonica* p.a.

Moderately-steep southerly midslopes, not very rocky surface.

d *Pinus flexilis*
 d *Abies concolor*
 a-s *Pseudotsuga menziesii*
 a *Pinus ponderosa*
Fragaria spp.
Artemisia franserioides

Rosa woodsii

Festuca arizonica
Carex rossii
Poa fendleriana

- San Juan NF, 8780 ft. (De Velice et al. 1985)

ALSO SEE: - Abco-Psme/Fearl

- Psme/Fearl

CC
 00113 Abco-Psme/Hodu

Abies concolor-*Pseudotsuga menziesii*/*Holodiscus dumosus* p.a.

- = Abco/Hodu h.t. (De Velice et al. 1984)
- = Abco/sparse h.t. (Alexander et al. 1984)

Rocky, scree slopes, cool dry sites, 65-85% slopes, southerly-westerly slopes.

d *Abies concolor*
 d *Pseudotsuga menziesii*
 s-a *Pinus ponderosa*
 a *Pinus flexilis*
 a *Pinus aristata*
 a *Juniperus scopulorum*
 a *Pinus strobiformis*

Holodiscus dumosus
Ribes inerme
Jamesia americana
Ribes cereum

Carex rossii

- Rio Grande NF, 8700-8800 ft. (De Velice et al. 1985)
- n New Mexico, 9100 ft. (De Velice et al. 1985)
- sc New Mexico, 8000-9000 ft. (Alexander et al. 1984)

RECEIVED: FPMG/10-11
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Abco-Psme/Juco

= Abco/Juco h.t. (Youngblood and Mauk 1985)

Gentle to steep northerly slopes, gravelly soils from a variety of substrates.

- s Utah. 7400-9200 ft. (Youngblood and Mauk 1985, Mueggler and Campbell 1986)

- Abco-Psme/Syor1

[illegible]

Abco-Psme/Mare

= *Abco/Berberis repens* h.t. phase *Berberis repens* (Mauk and Henderson 1984)

Gentle to steep northerly slopes and benches, variety of substrates, gravelly loams.

- ne Utah, 7400-7900 ft. (Mauk and Henderson 1984)

- sc Utah, 7300-9600 ft. (Youngblood and Mauk 1985, Graybosch and Buchanan 1983)

PHASE: 1. *Juniperus communis* conspicuous -- s Utah (Youngblood and Mauk 1985).

- Abco-Psme/Juco

[illegible]

Abco-Psme/Phma

* Abco/Phma h.t. (Mauk and Henderson 1984)

Moderate to very steep northerly slopes, variety of substrates and soil textures.

d <i>Abies concolor</i>	<i>Physocarpus malvaceus</i>
d <i>Pseudotsuga menziesii</i>	<i>Paxistima myrsinites</i>
s <i>Populus tremuloides</i>	<i>Amelanchier alnifolia</i>
a <i>Abies lasiocarpa</i>	<i>Symphoricarpos oreophilus</i>
	<i>Mahonia repens</i>
	<i>Quercus gambelii</i>
	<i>Rosa woodsii</i>
<i>Osmorhiza chilensis</i>	<i>Carex geyeri</i>
<i>Mitella stauropetala</i>	
<i>Lathyrus lanszwertii</i>	
<i>Lathyrus pauciflorus</i>	

- n Utah (Mauk and Henderson 1984)
- s Utah, >7500 ft. (Youngblood and Mauk 1985)

ALSO SEE: - Psem/Phma
- Abla-Psme/Phma

00105 Abco-Psme/Quga

Abies concolor-*Pseudotsuga menziesii*/*Quercus gambelii* p.a.
= Abco/Quga h.t. (De Velice et al. 1985, Youngblood and Mauk 1985)
= Abco/Gatr h.t., in part (De Velice et al. 1985) (see phases Gatr and Pamy)

Moderate temperature and moisture, gentle to steep canyon sideslopes, all exposures, often lithic soils, often opposite Abco-Psme/Acgl, 7400-9600 ft.

d <i>Abies concolor</i>	<i>Quercus gambelii</i>
d <i>Pseudotsuga menziesii</i>	<i>Robinia neomexicana</i>
s <i>Pinus ponderosa</i>	<i>Symphoricarpos oreophilus</i>
s-a <i>Pinus strobiformis</i>	<i>Mahonia repens</i>
a <i>Populus tremuloides</i>	
a <i>Picea pungens</i>	
a <i>Juniperus scopulorum</i>	
<i>Lathyrus arizonicus</i>	<i>Carex rossii</i>
<i>Thalictrum fendleri</i>	<i>Poa fendleriana</i>
<i>Achillea lanulosa</i>	<i>Bromus canadensis</i>
<i>Thermopsis</i> sp.	
<i>Viola canadensis</i>	
<i>Pseudocymopterus montanus</i>	

- San Juan NF, 8100-8500 ft. (Moir and Ludwig 1979, De Velice et al. 1985, Mathiasen et al. 1986)
- n New Mexico, 8500-9500 ft. (De Velice et al. 1985)
- sw New Mexico, 7400-9600 ft. (Fitzhugh et al. 1983)
- se Arizona-sw New Mexico, 6700-7300 ft. (De Velice and Ludwig 1983, Gottfried and Patton 1984)
- sc New Mexico, 7000-9000 ft. (Alexander et al. 1984)
- c-s Utah, 6200-8600 ft. (Youngblood and Mauk 1985)
- sw Utah, 7100-7400 ft. (Madany and West 1984)

PHASES: 0. Typical, *Quercus gambelii* conspicuous, with *Bromus canadensis*, *Poa fendleriana*, *Carex rossii*, and occasional

rhizomatous *Carex* spp. --San Juan NF (Moir and Ludwig 1979, De Velice et al. 1983), sw New Mexico (Fitzhugh et al. 1983), sc New Mexico (Alexander et al. 1983).

2. *Festuca arizonica* and/or *Carex rossii* dominant-codominant in herb layer, usually with *Muhlenbergia montana*, *Poa fendleriana*, *Geranium caespitosum*, *Erigeron* sp., and *Artemisia ludoviciana* -- sc New Mexico (Alexander et al. 1984). Also see Pipo/Quga phase Fearl and Pipo-Psme/Fearl.

3. *Galium triflorum* conspicuous with *Populus angustifolia*, on streamside benches, with *Clematis ligusticifolia*, *Smilacina stellata*, and *Equisetum arvense*, 2-4% slope -- n New Mexico, 6640-7700 ft. (De Velice et al. 1985)

4. *Paxistima myrsinites* abundant on streamside benches, with *Padus virginiana*, *Alnus* spp., and *Salix* spp. -- n New Mexico, 8000 ft. (De Velice et al. 1985)

CC
00102 Abco-Psme/sparse

Abies concolor-*Pseudotsuga menziesii*/sparse understory p.a.

= Abco-Psme h.t. phase *Berberis repens* (Moir & Ludwig 1979)

= Abco/sparse h.t. (Fitzhugh et al. 1983, De Velice et al. 1985)

Cool, dry, generally steep slopes, or steep to very steep canyon sideslopes and ridges, various aspects, sandy loams or more commonly stony-rough broken land, 8200-10500 ft., 8600-9500 ft. in c-n Arizona and sw New Mexico.

d *Abies concolor*
d *Pseudotsuga menziesii*
s *Populus tremuloides*
a *Pinus strobiformis*
a *Pinus ponderosa*
a *Juniperus scopulorum*
a *Picea engelmannii*

Senecio neomexicanus
Oreochrysum parryi

Mahonia repens
Juniperus communis
Paxistima myrsinites
Rosa woodsii
Symphoricarpos oreophilus

Carex rossii
Koeleria macrantha
Bromus canadensis
Poa fendleriana

- San Juan NF, 8700 ft. (Moir and Ludwig 1979, De Velice et al. 1985, Mathiasen et al. 1986)
- Rio Grande NF, 9250 ft. (De Velice et al. 1985)
- San Isabel NF, 9100-9600 ft. (De Velice et al. 1985)
- n New Mexico, 9000-10100 ft. (De Velice et al. 1985)
- se Arizona-sw New Mexico, 8500-9200 ft. (De Velice and Ludwig 1983)
- sw New Mexico, 8550-9500 ft. (Fitzhugh et al. 1983)

Mahonia repens has higher constancy, but all species in the understory are very sparse in this community. Moir and Ludwig (1979) state that in the Sangre de Cristo Mountains, this community occupies dry s-w-facing borders of mixed-conifer forests, and there *Abies concolor* may be "absent or of minor climax status."

ALSO SEE: - Abco-Psme/Hodu
- Abco-Psme/Syorl
- Abco-Psme/Juco

CC
00114 Abco-Psme/Syorl

Abies concolor-*Pseudotsuga menziesii*/*Symphoricarpos oreophilus* p.a.

- = Abco/Erex h.t., in part (De Velice et al. 1985)
- = Abco/sparse h.t., in part (De Velice et al. 1985)
- = Abco/Berberis repens h.t. phase Syorl (Mauk and Henderson 1984, Youngblood and Mauk 1985)

Moderate to moderately-steep northerly slopes, upper to lower slopes, mostly on limestone substrates.

d Abies concolor	Symphoricarpos oreophilus
a-d Pseudotsuga menziesii	Rosa woodsii
a Picea pungens	Physocarpus monogynus
a Pinus strobiformis	Mahonia repens
s Populus tremuloides	Amelanchier alnifolia
s Pinus ponderosa	Clematis columbiana
a Juniperus scopulorum	
Lathyrus spp.	Bromus canadensis
Oreochrysum parryi	Carex foenea
Geranium richardsonii	Carex rossii
Smilacina stellata	Poa fendleriana
Artemisia franserioides	

- n New Mexico, 8500-9700 ft. (De Velice et al. 1985)
- San Juan NF, 6900 ft. (De Velice et al. 1985)
- San Isabel NF, 8450 ft. (De Velice et al. 1985)
- n Utah, 5700-8000 ft. (Mauk and Henderson 1984)
- s Utah, 8400-9300 ft. (Youngblood and Mauk 1985)
- Utah, 7200-8900 ft. (Muegler and Campbell 1986)

The n Utah community has more *Paxistima myrsinites* and *Pseudostellaria jamesiana*.

ALSO SEE: - Abco-Psme/Erex
- Abco-Psme/sparse
- Abco-Psme/Phma
- Psme/Svor1

00110 Abco-Psme/Vamv

Abies concolor-*Pseudotsuga menziesii*/*Vaccinium myrtillus* p.a.

= Abco/Vamy h.t. (De Velice et al. 1984)

Steep, cold, northerly slopes, elevations below subalpine fir and Engelmann spruce reproduction, cryic soils, coldest sites of white fir forests, 8500-9400 ft.

d <i>Abies concolor</i>	<i>Vaccinium myrtillus</i>
d <i>Pseudotsuga menziesii</i>	<i>Paxistima myrsinites</i>
s <i>Populus tremuloides</i>	<i>Mahonia repens</i>
a <i>Pinus ponderosa</i>	<i>Rosa woodsii</i>
a <i>Picea engelmannii</i>	<i>Physocarpus monogynus</i>
a <i>Abies lasiocarpa</i>	<i>Salix scouleriana</i>
a <i>Pinus strobiformis</i>	
<i>Thermopsis divaricarpa</i>	
<i>Lathyrus arizonicus</i>	<i>Bromus ciliatus</i>
<i>Oreochrysum parryi</i>	<i>Oryzopsis asperifolia</i>
<i>Erigeron eximius</i>	
<i>Artemisia franserioides</i>	
<i>Thermopsis divaricata</i>	

- San Juan NF, 8500-9000 ft. (De Velice et al. 1985)
- San Isabel NF, 8700-8800 ft. (De Velice et al. 1985, Powell^r 1985)
- n New Mexico, 8900-9400 ft. (De Velice et al. 1985)

ALSO SEE: - Pienl/Vamy

CC

ABIES LASIOCARPA SERIES (002)

00201

Abla/Cagel

Abies lasiocarpa/Carex geyeri p.a.

Closed forest, 10-30% slopes with variable aspects, level to gently sloping, upper slopes and moderately exposed ridges, northerly aspects lower and southerly higher, pH 5.2-7.2, 8900-9760 ft.

d Abies lasiocarpa	Symphoricarpos oreophilus
s Populus tremuloides	
Fragaria virginiana	Carex geyeri
Ligusticum porteri	Bromus canadensis
Thalictrum fendleri	Elymus trachycaulus
Aquilegia coerulea	Elymus glaucus
Achillea lanulosa	Bromus porteri
Cerastium arvense	
Galium septentrionale	
Osmorhiza chilensis	
Vicia americana	

- Grand Mesa NF, 9800 ft. (Johnston and Hendzel 1985)
- Arapaho NF, 8900-9760 ft. (Hess and Wasser 1982, Wasser and Hess 1982)
- San Juan NF (Johnston and Hendzel 1985)

This series includes only stands dominated solely by Abies lasiocarpa. If this is accepted, the series called "Abies lasiocarpa" by Pfister et al. (1977), Steele et al. (1979), Wirsing and Alexander (1975), Hoffman and Alexander (1976, 1980), and others, should better be termed the "Abies lasiocarpa-Picea engelmannii series."

This p.a. occupies drier sites at lower elevations, on gentler slopes, sw-nw exposure, as compared with Abla-Pienl/Cagel.

CC

00203

Abla/Mare

Abies lasiocarpa/Mahonia repens p.a.

= Abla/Berberis repens h.t. (Youngblood and Mauk 1985)

Moderate to steep lower to middle northerly slopes, cool and dry, variety of substrates and soil textures.

d Abies lasiocarpa	Mahonia repens
s Populus tremuloides	Symphoricarpos oreophilus
s Pseudotsuga menziesii	Rosa woodsii
s Picea pungens	
a Pinus ponderosa	
s Abies concolor	
a Picea engelmannii	
	Carex rossii

- s Utah, 9000-10000 ft. (Youngblood and Mauk 1985)

ALSO SEE: - Abia-Pifl/Mare
- Psme/Svorl

00202 Abla/Thfe1

Abies lasiocarpa/*Thalictrum fendleri* p.a.

= Abila/Osch h.t. (Mauk and Henderson 1984)

= Potr1-Abla/Syor1/Sese c.t. (Mueggler and Campbell 1986)

Deeper, moister soils; moderately steep lower slopes to middle slopes; sedimentary substrates weathered in place, no surface rock, loams to sandy loams to clay loams.

d Abies lasiocarpa	Symphoricarpos oreophilus
s Populus tremuloides	
a Picea engelmannii	
a Pseudotsuga menziesii	
Thalictrum fendleri	Bromus carinatus
Osmorhiza chilensis	Elymus glaucus
Pseudostellaria jamesiana	Elymus trachycaulus
Lathyrus spp.	
Senecio serra	
Rudbeckia occidentalis	
Aster engelmannii	

- n Utah, 7000-8800 ft. (Mauk and Henderson 1984)
- San Juan NF, 9100 ft.
- Utah, 6800-8900 ft. (Mueggler and Campbell 1986)

Most stands seems were still dominated by *Populus tremuloides*, with the absence of the usual indicators of shaded forest floors. This is a very rich type in number of herbaceous species and their quantity.

ALSO SEE: - Potr1/Thfe1
- Potr1/Svor1

[illegible]

ABIES LASIOCARPA-PICEA ENGELMANNII SERIES (003)

00327 Abba-Pien1/Acgl

Abies lasiocarpa-Picea engelmannii/Acer glabrum p.a.

= *Abla/Ag1* h.t. (Youngblood and Mauk 1985, Steele et al. 1981-1983, Mauk & Henderson 1984)

= Potri-Abla/Amal c.t. (Mueggler and Campbell 1986)

Canyon slopes along streams and ravines, very steep northerly slopes, loamy soils from sedimentaries or sandy volcanics, moderately thick litter layer, 4800-9900 ft.

d Abies lasiocarpa	Acer glabrum
a-d Picea engelmannii	Symphoricarpos oreophilus
d-s Abies concolor	Paxistima myrsinites
d-s Pseudotsuga menziesii	Mahonia repens
s Populus tremuloides	Sorbus scopulina
a Picea pungens	Amelanchier alnifolia
a Pinus flexilis	Clematis columbiana

Arnica cordifolia
Orthilia secunda
Thalictrum fendleri
Astragalus miser
Arnica latifolia
Fragaria virginiana
Ligusticum filicinum
Geranium viscosissimum
Chamerion angustifolium
Galium septentrionale
Osmorhiza chilensis
Lupinus argenteus
Moneses uniflora

Poa nervosa
Elymus glaucus

- ec Idaho, 7100-8800 ft. (Steele et al. 1981)
- Montana, 6900-8400 ft. (Pfister et al. 1977)
- Bighorn NF, 8350-8960 ft. (Hoffman and Alexander 1976)
- Shoshone NF, 7400-9500 ft. (Steele et al. 1979, Alexander 1981AB)
- w Wyoming, 7050-9020 ft. (Youngblood and Mueggler 1981)
- nw Wyoming, 7300-8960 ft. (Cooper 1975)
- nw Utah, 7400-8500 ft. (Ream 1964)
- n Nevada (Lewis 1975)
- n Gunnison NF, 9300-10900 ft. (Komarkova 1986)

PHASES: 1. *Astragalus miser* codominant with *Arco2* on e to s aspects with more *Paxistima myrsinites*, *Aster perelegans*, *Pedicularis racemosa*, and *Senecio streptanthifolius*, 7400-8800 ft.-- Shoshone NF (Steele et al. 1979)

2. *Shepherdia canadensis* dominates undergrowth on e to n aspects on sandstone or granite, 7400-8700 ft. -- Shoshone NF (Reed 1976, Steele et al. 1979)

3. *Picea engelmannii* major seral species, associated with *Hypnum revolutum*, varying to Pienl/Moss p.a. -- Shoshone NF (Steele et al. 1979).

The herbaceous layer is the best-developed, but often even it is relatively sparse.

	Cccccccccc
00303	Abla-Pien1/Arla

Abies lasiocarpa-Picea engelmannii/Arnica latifolia p.a.

= Abila/Arla h.t. (Steele et al. 1979)

Gentle to moderate terrain, all but s aspects, pH 5.0-6.0. Appears to replace Abia-Pienl/Vasc.

Abies lasiocarpa
Picea engelmannii
Pseudotsuga menziesii

Ribes montigenum
Paxistima myrsinites

s Pinus contorta
s Populus tremuloides

Arnica latifolia
Aster engelmannii
Pedicularis racemosa

- Shoshone NF, 7400-9300 ft. (Steele et al. 1979)
- w Wyoming
- se-ne Idaho
- n Utah

ALSO SEE: - Abila-Pienl/Vace
- "Abila/Vasc phase Arla" from n Utah, 9000-10600 ft. (Mauk & Henderson 1984)

[illegible]

Abla-Pienl/Caca

= Abila/Caca h.t. (Henderson et al. 1977, Pfister et al. 1977, Steele et al. 1979-1981, Cooper et al. 1983, Mauk & Henderson 1984)

= Pienl/Caca h.t. (Hess 1981)

= Pico/Caca c.t. (Mauk & Henderson 1984)

a-d Abies lasiocarpa
d Picea engelmannii
s Pinus contorta
s Populus tremuloides
a Pseudotsuga menziesii

Vaccinium scoparium

Kalmia polifolia

Ribes lacustre

Salix spp.
Calamagrostis

Arnica latifolia

Senecio triangulatus

Streptopus rassetii
Veratrum tenuipetalum

Trollius albidiflorus
Geldum triflorum

Galium triflorum
Thalictrum occidentale

Thalictrum occidentale

Moss

Carex spp.

Luzula spp.

Luzula spp.

- Yellowstone NP (Romme 1979)

- c-s Idaho, 5100-9000 ft. (

- n Utah. 7700-10000 ft. (Henderson et al. 1977. Mauk and Henderson

- wc-sc Montana (Pfister et al. 1977)

- Shoshone NF (Terwilliger et al. 1977)

Shoshone M. (Kerwillinger et al. 1979; Steele et al. 1983)

This p.a. is probably the typical phase, as described by Pfister et al. (1977) and Cooper et al. (1983). It includes *Fragaria* sp., *Pinus albicaulis*, *Vaccinium globulare*, *Linnaea borealis*, and *Trautvetteria carolinensis*.

- Roult NF (Terwilliger et al. 1979)

- Arapaho NF, 9020-10000 ft. (Hess 1981, Alexander 1981AB, Wasser and Hess 1982, Hess and Alexander 1986)

- Roosevelt NF

- White River NF (Terwilliger et al. 1979)

- Gunnison NF, 8920 ft. (Komarkova 1986)

Hess' (1981) study shows *Abla* and *Pien1* codominant. Associated species include *Carex aquatilis*, *Carex nebrascensis*, *Carex ebenea*, *Mertensia ciliata*, *Mitella pentandra*, *Equisetum arvense*, and *Caltha leptosepala*.

ALSO SEE: - *Pigl-Pien1-Diin-Caca-EQUI* from British Columbia (Pojar et al. 1984), with *Distigia involucrata* and *Equisetum* spp. subdominant.

00328 *Abla-Pien1/Carul*

Abies lasiocarpa-Picea engelmannii/Calamagrostis rubescens p.a.

= *Abla/Carul* h.t. (Pfister et al. 1977, Steele et al. 1981-1983)

Warm, dry, gentle to moderate slopes or ridges, on sedimentary or granitic substrates, pH 5.5-6.3, mostly silt loams and silts, also clay loams or sandy loams.

d <i>Abies lasiocarpa</i>	<i>Juniperus communis</i>
a-d <i>Picea engelmannii</i>	<i>Symphoricarpos oreophilus</i>
s-d <i>Pseudotsuga menziesii</i>	<i>Amelanchier alnifolia</i>
s <i>Pinus contorta</i>	
s <i>Populus tremuloides</i>	
<i>Arnica cordifolia</i>	<i>Calamagrostis rubescens</i>
<i>Osmorhiza chilensis</i>	<i>Carex geyeri</i>
<i>Orthilia secunda</i>	<i>Carex rossii</i>
<i>Thalictrum occidentale</i>	
<i>Achillea lanulosa</i>	
<i>Viola adunca</i>	

- w Montana, 5800-7700 ft. (Pfister et al. 1977)
- w Idaho, 5200-6100 ft. (Steele et al. 1981)
- w Wyoming, 6100-8500 ft. (Steele et al. 1983)
- se Idaho, 7200-8400 ft. (Stauffer and Peterson 1982)
- Medicine Bow NF (Wirsing 1973)
- n Utah, 6900-7600 ft. (Mauk and Henderson 1984)

PHASE: 1. *Paxistima myrsinites* conspicuous, with *Pseudotsuga menziesii* conspicuous seral dominant and less *Pinus contorta*; *Mahonia repens* and *Salix scouleriana* more abundant; *Carex geyeri* less abundant -- se Idaho and w Wyoming (Steele et al. 1983); n Utah (Mauk and Henderson 1984). Also see *Abla-Pien1/Pamy*.

- ALSO SEE: - *Psme/Carul*
 - *Abla-Pien1/Pamy*
 - *Abla-Pien1/Vace*

00307 *Abla-Pien1/Cagel*

Abies lasiocarpa-Picea engelmannii/Carex geyeri p.a.

- = *Abla/Cagel* h.t. (Wirsing & Alexander 1975, Pfister et al. 1977, Steele et al. 1979-1981, Hoffman & Alexander 1980, Cooper 1975, Youngblood & Mauk 1985)
- = *Pien1/Cagel* h.t. (Hess 1981)
- = *Pien1-Abla/Cagel* h.t. (Hess & Wasser 1982)
- = *Abla/Berberis repens* h.t. phase *Cagel* (Mauk & Henderson 1984)

Shallow slopes and ridgetops, se-sw-facing 6-48%. lower subalpine zone, loam to sandy loam, mostly from sedimentary substrates, 6600-7700 ft. in s Montana, 7900-9500 ft. in n Wyoming, and 6900-10700 ft. in Colorado, pH 4.6-6.4.

a-d <i>Picea engelmannii</i> d <i>Abies lasiocarpa</i>	<i>Juniperus communis</i>
a-s <i>Pinus contorta</i> s <i>Populus tremuloides</i>	
(a) <i>Pinus flexilis</i>	
<i>Arnica cordifolia</i> <i>Osmorhiza</i> sp. <i>Thalictrum</i> sp. <i>Pedicularis racemosa</i>	<i>Carex geyeri</i>

- A - Montana, 6600-7700 ft. (Pfister et al. 1977, Alexander 1981AB)
 - c Idaho, 7300-9200 ft. (Steele et al. 1981, Schlatterer 1972)
 - nw Wyoming, 7900-9500 ft. (Steele et al. 1983, Cooper 1975)
 - Shoshone NF (Terwilliger et al. 1979)
 - n Nevada (Lewis 1975)

This is stated by Steele et al. (1979) to be the typical, Cagel phase. These seem related to *Abla-Pienl/Thoc*. In addition, they have:

s <i>Pinus albicaulis</i>	<i>Mahonia repens</i> <i>Spiraea betulifolia</i> <i>Ribes lacustre</i> <i>Vaccinium globulare</i> <i>Calamagrostis rubescens</i>
<i>Thalictrum occidentale</i> <i>Arnica latifolia</i> <i>Osmorhiza chilensis</i>	

- B - Routt NF, 6930-9680 ft. (Hoffman and Alexander 1980, Johnston and Hendzel 1985)
 - Medicine Bow NF, ca. 8700 ft. (Wirsing and Alexander 1975, Alexander et al. 1986)
 - Arapaho NF, 9000-10400 ft. (Hess 1981)
 - White River NF, 8900-10700 ft. (Hess and Wasser 1982, Hoffman 1982, Wasser and Hess 1982)
 - Uncompahgre NF, 8900-9000 ft. (Johnston and Hendzel 1985)
 - c Colorado (Steen and Dix 1974)
 - c-s Utah, 8800-9800 ft. (Youngblood 1984)
 - n Utah, 6800-9800 ft. (Mauk and Henderson 1984)
 - Gunnison NF, 8800-10800 ft. (Johnston and Hendzel 1985, Komarkova 1986)

a-s <i>Pseudotsuga menziesii</i>	<i>Ribes montigenum</i> <i>Paxistima myrsinites</i> <i>Lonicera involucrata</i> <i>Mahonia repens</i> <i>Vaccinium scoparium</i> <i>Distegia involucrata</i>
<i>Thalictrum fendleri</i> <i>Lathyrus leucanthus</i> <i>Vicia americana</i> <i>Oreochrysum parryi</i>	<i>Bromus porteri</i> <i>Bromus canadensis</i> <i>Carex foenea</i>

Aster engelmannii
 Ligusticum porteri
 Fragaria virginiana
 Osmorhiza depauperata
 Moss

Gently sloping to moderate steep w-wnw-facing slopes (10-46%) at lower elevations, steeper (10-54%) at higher elevations. Moderately deep, gravely-cobbly, moderate permeable soils, pH 5.0-7.0. Seral stands dominated by aspen show high cover of undergrowth species belonging to the "Thfel union," i.e., Lale-Viam-Asen-Lipo-Osde. As the community moves towards dominance by Abia-Pienl through succession, it shows more Cagel-Pera.

Climax stands of Abia-Pienl/Cagel in Colorado are not very common. Succession may be very slow on some sites.

ALSO SEE: - Abia/Cagel
 - Abia-Pienl/Pamy
 - Abia-Pienl/Mare

CC
 00326 Abia-Pienl/Caro3

Abies lasiocarpa-Picea engelmannii/Carex rossii p.a. -
 = Abia/Caro3 h.t. (Steele et al. 1983, Youngblood 1984)
 = Pienl/Saxifraga bronchialis (Ciliaria austromontana) h.t. (De Velice et al. 1984)
 = Abia/Pedicularis racemosa h.t. phase Pera2 (Mauk and Henderson 1984)

Sparse understory, sometimes on scree slopes or with gravelly soil surfaces, very little litter cover.

a-d Abies lasiocarpa
 d Picea engelmannii
 s Populus tremuloides
 a Pinus flexilis

Carex rossii

A - w Wyoming, 7400-8000 ft. (Steele et al. 1983)
 - s Idaho
 - Utah, 7300-10400 ft. (Youngblood and Mauk 1985, Mauk and Henderson 1984, Mueggler and Campbell 1986)

s Pinus contorta	Paxistima myrsinites
Osmorhiza chilensis	
Arnica cordifolia	
Achillea lanulosa	
Pedicularis racemosa	

B - s Colorado, over 8100 ft. (De Velice et al. 1984)
 - n New Mexico

a Pseudotsuga menziesii	Juniperus communis
Ciliaria austromontana	Festuca brachyphylla

ALSO SEE: - Abia-Pienl/Juco

00308 Abia-Pien1/Erex

Abies lasiocarpa-Picea engelmannii/Erigeron eximius p.a.

- = Abia/Erigeron superbus h.t. (Moir & Ludwig 1979, Rominger & Paulik 1983)
- = Abia/Erex h.t. (Fitzhugh et al. 1983, De Velice et al. 1985)

Gentle to moderate slopes, rolling uplands, upper canyonsides, or canyonsides, 4-70%, variety of aspects, 9000-10900 ft. in Arizona and New Mexico, basalts, granites, and sedimentary.

d Abies lasiocarpa	Paxistima myrsinites
d Picea engelmannii	Vaccinium sp.
s Pseudotsuga menziesii	Rubus parviflorus
s Abies concolor	
s Picea pungens	
s Populus tremuloides	
a Pinus flexilis	
Erigeron eximius	Bromus canadensis
Lathyrus arizonicus	
Fragaria virginiana	
Geranium richardsonii	
Oreochrysum parryi	
Viola canadensis	
Artemisia franserioides	
Osmorhiza depauperata	

- Rio Grande NF, 9200-10500 ft. (Moir and Ludwig 1979)
- San Juan NF, 9000-10200 ft. (De Velice et al. 1985)
- San Isabel NF, 9000-10100 ft. (De Velice et al. 1985)
- n New Mexico, 9200-10900 ft. (De Velice et al. 1985)
- ec-nc Arizona, 9000-10200 ft. (Fitzhugh et al. 1983)

ALSO SEE: - Abia-Pien1/Rupa and phase Vasc
- Abia-Pien1/Pamy

00309 Abia-Pien1/Juco

Abies lasiocarpa-Picea engelmannii/Juniperus communis p.a.

- = Abia/Juco h.t. (Steele et al. 1979-1981, Moir & Ludwig 1979, Youngblood and Mauk 1985)
- = Abia/Ciau h.t. (De Velice et al. 1984)
- = Abia/Berberis repens h.t. phase Juco (Mauk & Henderson 1984)
- = Pien1/Ciau h.t. in part (De Velice et al. 1985)

Gentle hot, dry, n-e-facing slopes, 6500-9400 ft. in n Wyoming, ca. 10500 ft. in nc New Mexico, pH 5.2-7.9.

a-d Abies lasiocarpa	Juniperus communis
a-d Picea engelmannii	Shepherdia canadensis
s Pseudotsuga menziesii	Symphoricarpos oreophilus
s Populus tremuloides	
a Abies concolor	
Arnica cordifolia	Bromus canadensis
Orthilia secunda	Carex rossii

A - Shoshone NF -- e slopes Wind Rivers and Absarokas (Steele et al. 1979)

- c Idaho, 7400-8600 ft. (Alexander 1981AB, Steele et al. 1981)
- n-c Utah, 8300-10600 ft. (Youngblood and Mauk 1985, Mauk and Henderson 1984, Mueggler and Campbell 1986)

Pinus contorta is the principal seral tree in c Idaho and Wyoming;
Populus tremuloides is seral elsewhere. Also includes:

s *Pinus contorta*

Mahonia repens

Rosa spp.

Achillea lanulosa

Poa nervosa

- B - n Arizona (Moir and Ludwig 1979)
- n New Mexico
- San Juan NF, 9980-10800 ft. (De Velice et al. 1985)
- Rio Grande NF, 10150 ft. (De Velice et al. 1985)
- White River NF, 10500-10600 ft.
- Gunnison NF, 10340 ft. (Komarkova 1986)

Scree slopes, with:

Ribes montigenum

Ribes wolffii

Ciliaria austromontana

Festuca brachyphylla

Senecio atratus

Valeriana capitata

Fragaria virginiana

ALSO SEE: - Abba-Pien1/RIBE
- Pien1/moss
- Abba-Pien1/Pone2

[illegible]

Abies lasiocarpa-*Picea engelmannii*/*Linnaea borealis* p.a.
= Abila/Libo h.t. (Pfister et al. 1977, Steele et al. 1979-1981, De
Velice et al. 1983)

= Apla/Vasc/Libo h.t. (Moir & Ludwig 1979) -- see phase Vasc

= PICE-Abla/Libo h.t. (Cooper 1975)

= Pien1-Abla/Vasc h.t. phase Libo (Hess & Wasser 1982)

= Abila/Vamy-Libo h.t. (De Velice et al. 1985)

Glacial till and steep lower slopes, cool dry, cool moist, well-drained slopes and benches, gentle slopes, variety of aspects, pH 5.0-6.8, 5000-7400 ft. in c Idaho, 8700-9900 ft. in s Colorado.

d *Abies lasiocarpa*

Lonicera spp.

d *Picea engelmannii*

a-s Pseudotsuga menziesii

Linnaea borealis

Orthilia secunda

Arnica cordifolia

Fragaria spp.

- A - Montana (Pfister et al. 1977)
- c Idaho, 5000-7400 ft. (Steele et al. 1981)
- w Wyoming, 6200-8350 ft. (Steele et al. 1979, Cooper 1975)
- Shoshone NF
- Bighorn NF

a <i>Pinus albicaulis</i>	<i>Lonicera utahensis</i>
	<i>Juniperus communis</i>
	<i>Shepherdia canadensis</i>
	<i>Vaccinium globulare</i>
	<i>Ribes lacustre</i>
<i>Arnica latifolia</i>	<i>Calamagrostis rubescens</i>
<i>Thalictrum occidentale</i>	<i>Elymus glaucus</i>
<i>Chimaphila umbellata</i>	<i>Oryzopsis asperifolia</i>
<i>Galium triflorum</i>	<i>Carex geyerii</i>

B - c and s Colorado (Alexander 1981AB)

- Rio Grande NF, 9450 ft. (Moir and Ludwig 1979, De Velice et al. 1985, Mathiasen et al. 1986)
- San Juan NF, 8740-10000 ft. (De Velice et al. 1985)
- San Isabel NF
- nc New Mexico
- Arapaho NF
- White River NF

In addition, this includes:

s Populus tremuloides	Rosa sp.
s Abies concolor	Rubus parviflorus
s Picea pungens	Distegia involucrata
	Paxistima myrsinites
Lathyrus arizonicus	Trisetum spicatum
Oreochrysum parryi	
Erigeron eximius	
Artemisia franserioides	
Fragaria virginiana	

PHASE: 1. *Vaccinium scoparium* and/or *Vaccinium myrtillus* dominates undergrowth at higher elevations, *Lonicera utahensis* often present, *Paxistima myrsinites* more abundant -- Shoshone NF (Steele et al. 1979), w Montana (Pfister et al. 1977). Gentle n slopes and benches, *Pinus contorta* conspicuous seral species, with a Vasc-Libo-Carul layer -- c Idaho (Steele 1981), w Wyoming, 75570-8350 ft. (Cooper 1975), White River NF (Hess & Wasser 1982); Rio Grande-San Juan-San Isabel NFs, 8800-10400 ft. (De Velice et al. 1985).

ALSO SEE: - Ab1a-Pien1/Vasc
- Ab1a-Pien1/Pamy

Some stands may be completely lacking *Abies lasiocarpa*; some others may have *Picea engelmannii* in much less quantity than *Abies lasiocarpa*.

00304 Ab1a-Pif1/Mare

Abies lasiocarpa-Pinus flexilis/Mahonia repens p.a.

- = *Abla/Berberis repens* h.t. (Pfister 1972, Henderson et al. 1977, Steele et al. 1979, Youngblood 1984)
- = *Abla/Berberis repens* h.t. phase Pif1 (Mauk & Henderson 1984) (see phase Pamy)

A variety of substrates, lower to middle elevations, most common on moderate n slopes, 6600-8900 ft., pH 4.6-7.1.

- c Colorado (Steen and Dix 1974, Alexander 1981A)
- San Juan NF, 9000-11300 ft. (De Velice et al. 1985)
- nw New Mexico, 9600-11200 ft. (De Velice et al. 1985)
- San Isabel NF, 10100-10740 ft. (De Velice et al. 1985, Powell 1985)

00311	Abla-Pien1/moss
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Dry higher elevations, gentle to steep ridges and upper n slopes, s slopes and saddles, 9840-11500 ft. in nc New Mexico, very well-drained lithic-skeletal soils.

Vaccinium cespitosum
Vaccinium myrtillos
Lonicera utahensis
Paxistima myrsinites

Carex rossii
Poa nemoralis

- Medicine Bow NF (Alexander et al. 1986)
- Arapaho NF (Terwilliger et al. 1979)
- San Juan NF, 9840-11500 ft. (Moir and Ludwig 1979)
- n New Mexico, 10100-11500 ft. (De Velice et al. 1985)
- c Colorado (Steen and Dix 1974)
- nc Arizona, 10000-11000 ft. (Rominger and Paulik 1983)
- se Arizona-sw New Mexico, 10000-10100 ft. (De Velice and Ludwig 1983)
- Gunnison NF, 9850 ft. (Komarkova 1985)

69

and Pienl. The presence of *Vaccinium* spp. suggests that this community might be better expressed as a phase of Abia-Pienl/Vace or /Vamy.

CC
00313 Abia-Pienl/Pamy

Abies lasiocarpa-*Picea engelmannii*/Paxistima myrsinites p.a.

- = Pienl-ABIE/Pamy assn. (Daubenmire 1952)
- = Abia-Pamy h.t. (Daubenmire & Daubenmire 1968)
- = Psme-Abia-Pienl/Pamy-Cagel assn., in part (Boyce 1977)
- = Pienl-Abia/Pamy h.t. (Hess & Wasser 1982)
- = Abia/Berberis repens h.t. phase Rimo (Mauk & Henderson 1984) (see phase Rimo)
- = Abia/Berberis repens h.t. phases Berberis repens and Psme (Mauk and Henderson 1984)
- = Abia/Pedicularis racemosa h.t. phase Psme (Mauk and Henderson 1984) (see phase Psme)
- = Abia/Berberis repens h.t. phase Pienl (Youngblood and Mauk 1985)

Distinctly acid soils, pH 4.5-6.8, typic Cryandepts and Cryochrepts, 4700-5800 ft. in e Washington; 7950-9760 ft. in wc Colorado, ne-nw exposures, 18-93% slope.

d <i>Abies lasiocarpa</i>	<i>Paxistima myrsinites</i>
d <i>Picea engelmannii</i>	<i>Swida sericea</i>
d-s <i>Pseudotsuga menziesii</i>	<i>Sorbus scopulina</i>
a-s <i>Pinus contorta</i>	<i>Lonicera utahensis</i>
a <i>Pinus albicaulis</i>	<i>Vaccinium membranaceum</i>
s <i>Populus tremuloides</i>	<i>V. scoparium</i>
<i>Thalictrum occidentale</i>	<i>Bromus</i> spp.
<i>Arnica cordifolia</i>	<i>Carex geyseri</i>
<i>Orthilia secunda</i>	
<i>Aquilegia coerulea</i>	
<i>Galium septentrionale</i>	
<i>Osmorhiza depauperata</i>	
<i>Fragaria</i> spp.	

- A - e Washington (Daubenmire and Daubenmire 1968)
- n Idaho (Rickard 1960)
- nw Wyoming, 7310-8460 ft. (Cooper 1975)

- B - White River NF, 7950-9760 ft. (Boyce 1977, Hess and Wasser 1982, Wasser and Hess 1982)
- s Colorado (Alexander 1981AB)
- n Utah, 6100-10300 ft. (Mauk and Henderson 1984)
- s Utah, 8100-10800 ft. (Youngblood and Mauk 1985)

There are few grasses or grasslikes in these communities. The forbs are also comparatively few in number. The community described by Boyce (1977) has little *Picea engelmannii*, and in addition has *Rosa woodsii*, *Amelanchier alnifolia*, *Mahonia repens*, *Distegia involucrata*, *Rubus parviflorus*, *Thalictrum fendleri*, *Lathyrus leucanthus*, *Geranium richardsonii*, *Fragaria* sp., *Smilacina amplexicaulis*, *S. stellata*, *Osmorhiza depauperata*, *Galium septentrionale*, and *Actaea rubra*, at lower elevations and n-facing slopes. It is obviously closely related to Psme/Pamy, for they were included in the same association by Boyce.

PHASES: 1. *Pseudotsuga menziesii* codominant at lower elevations, with less *Picea engelmannii*, appearing like "Abia-Psme/Pamy," with

more *Symphoricarpos oreophilus* -- n Utah, 6100-8600 ft. (Mauk and Henderson 1984); s Utah (Youngblood and Mauk 1985).

2. *Ribes montigenum* conspicuous, with *Populus tremuloides* sometimes seral, and *Thalictrum fendleri* replacing *Thalictrum occidentale* -- n Utah, 6600-10100 ft. (Mauk and Henderson 1984)

ALSO SEE: - Abia-Pienl/Mare
 - Abia-Psme/Phma
 - Abia-Pienl/RIBE

CC
 00330 Abia-Psme/Phma

Abies lasiocarpa-*Pseudotsuga menziesii*/*Physocarpus malvaceus* p.a.
 = Abia/Phma h.t. (Mauk and Henderson 1984, Youngblood and Mauk 1985)

Northerly canyon slopes, moderately steep to very steep, variety of substrates, gravelly loams to gravelly clay loams.

d <i>Abies lasiocarpa</i>	<i>Physocarpus malvaceus</i>
d-s <i>Pseudotsuga menziesii</i>	<i>Paxistima myrsinites</i>
a-d <i>Picea engelmannii</i>	<i>Amelanchier alnifolia</i>
a <i>Abies concolor</i>	<i>Symphoricarpos oreophilus</i>
a-s <i>Populus tremuloides</i>	<i>Mahonia repens</i>
	<i>Rosa nutkana</i>
	<i>Ribes viscosissimum</i>

Mitella stauropetala
Orthilia secunda
Aster engelmannii
Fragaria vesca
Osmorhiza chilensis
Thalictrum fendleri
Viola adunca

- n Utah, 6600-7800 ft. (Mauk and Henderson 1984)
 - s Utah, 8200-9350 ft. (Youngblood and Mauk 1985)

ALSO SEE: - Psme/Phma
 - Abco-Psme/Phma
 - Abia-Pienl/Pamy

CC
 00315 Abia-Pienl/Pone2

Abies lasiocarpa-*Picea engelmannii*/*Poa nervosa* p.a.
 = Abia/Pone2 h.t. (Reed 1976, Henderson et al. 1977)

Wide variety of aspects and slopes, generally sw-facing, pH 5.3-5.7, 7700-9840 ft. in nw Wyoming.

d <i>Abies lasiocarpa</i>	<i>Shepherdia canadensis</i>
d <i>Picea engelmannii</i>	<i>Vaccinium scoparium</i>
s <i>Pinus contorta</i>	<i>Ribes montigenum</i>
a <i>Pinus flexilis</i>	
s <i>Populus tremuloides</i>	
<i>Arnica cordifolia</i>	<i>Poa nervosa</i>
<i>Chamerion angustifolium</i>	<i>Carex rossii</i>
<i>Fragaria</i> sp.	<i>Trisetum spicatum</i>
<i>Orthilia secunda</i>	
<i>Aquilegia coerulea</i>	
<i>Solidago multiradiata</i>	

- Shoshone NF, 7700-9840 ft. (Reed 1976, Wasser and Hess 1982)
- ne Utah, 9200-10500 ft. (Henderson et al. 1977)

This is very closely related to Abia-Pien1/Arco2 ph. Shca, and may be the same. Also see Pico/Pone2.

ALSO SEE: - Pico/Pone2
- Ab1a-Pien1/Juco

- Abila-Pien1/Juco
 00322 Abila-Pien1/RIBE

00322
Abies lasiocarpa-Picea engelmannii/Ribes spp. p.a.
(1977)

- = *Abla*-*Pien1*/RIBE/Arco2 assn. (Boyce 1977)
- = *Abla*/Rimo h.t. (Pfister 1972, Pfister et al. 1977, Henderson et al. 1977, Steele et al. 1979, 1981, Youngblood and Mauk 1985, Mauk & Henderson 1984)
- = PICE/Rimo h.t. (Steele et al. 1979, Pfister 1972)
- = *Abla*/Sesal h.t. (Moir & Ludwig 1979, Alexander et al. 1983)
- = *Pien1*/Rimo h.t. (Youngblood and Mauk 1985)
- = *Abla*/Pial/Rimo h.t. (Lewis 1975)
- = *Abla*/Aconitum columbianum h.t. (Youngblood and Mauk 1985) (see phase Thfel)

Rolling plateaus and shallow-moderate slopes, steeper slopes at lower elevations, variety of parent materials, loam-silt loam, pH 4.2-6.8, 8400-9700 in n Wyoming, 8700-10400 in n Colorado, 11900-12200 in s Colorado.

d <i>Abies lasiocarpa</i>	<i>Ribes montigenum</i>
d <i>Picea engelmannii</i>	<i>Vaccinium scoparium</i>
a <u><i>Pinus flexilis</i></u>	
<i>Arnica cordifolia</i>	<i>Carex</i> spp.
<i>Osmorhiza</i> spp.	<i>Trisetum spicatum</i>
<i>Pedicularis racemosa</i>	<i>Poa nervosa</i>
<i>Achillea lanulosa</i>	
<i>Fragaria virginiana</i>	
<i>Polemonium pulcherrimum</i>	

- A - n Nevada (Lewis 1975)
- s Montana, 8300-9000 ft. (Pfister et al. 1977)
- Shoshone NF, 8400-9700 ft. (Steele et al. 1979)
- Bighorn NF, 7000-8500 ft. (Olson and Gerhart 1982)
- sc Utah, 9500-11440 ft. (Steele 1972, Youngblood and Mauk 1985)
- ne Utah, 7000-10500 ft. (Henderson et al. 1977, Mauk and Henderson 1984)

Includes phases Rimo, Trsp, and Pico of Mauk and Henderson (1984), and phases Rimo and Mear of Youngblood and Mauk (1985).

s Pinus contorta	
s Pinus albicaulis	
a Populus tremuloides	
Osmorhiza chilensis	Carex rossii
Arnica latifolia	Poa secunda
Thalictrum fendleri	Festuca brachyphylla

- The understory may have little else besides *Ribes* spp.

Distegia involucreta
Ribes wolfii
Ribes lacustre
Ribes inerme
Rubus parviflorus
Vaccinium myrtillus
Carex geyeri
Bromus canadensis

Abla-Pien1/Rupa

= Abila/Vamy-Rupa h.t. (De Velice et al. 1985) (see phase Vasc)

Bromus canadensis

- San Juan NF, 8800-10500 ft. (De Velice et al. 1985)
- wc New Mexico, 8140-9900 ft. (Fitzhugh et al. 1983, Moir and Ludwig 1979)
- Rio Grande NF, 8500-10300 ft. (Moir and Ludwig 1979, De Velice et al. 1985)
- White River NF

Differs from Abila-Pien1/Erex in the conspicuous abundance of *Rubus parviflorus* and/or *Acer glabrum*.

PHASE: 1. *Vaccinium scoparium* and/or *Vaccinium myrtillus* dominant in lower layer; *Pinus contorta* may be seral; with more *Trisetum spicatum*, *Geranium richardsonii*, *Oreochrysum parryi*, and *Erigeron eximius*, at lower elevations, 8000-9720 ft. -- San Juan NF, Rio Grande NF, nc New Mexico (De Velice et al. 1985), wc New Mexico (Moir and Ludwig 1979, Fitzhugh et al. 1983), White River NF.

ALSO SEE: - Abia-Pienl/Erax

00323 Abba-Pienl/Sagll

Abies lasiocarpa-Picea engelmannii/Salix glauca p.a.

= Pienl/Salix pseudolapponum (Hess 1981)

= Pienl-Abla/Salix pseudolapponum (Hess & Wasser 1982)

Subalpine forest-alpine tundra interface, forming the krummholz forest, most fully expressed on exposed windswept moderate slopes (15-40%) with w-nw-n-ne aspects in relatively sheltered microsites with high snow accumulation and water retention, shallow-skeletal soils, pH 4.6-5.4, 11200-12300 ft. Both *Picea engelmannii* and *Abies lasiocarpa* dwarfed, shrub-like.

d <i>Picea engelmannii</i>	<i>Salix glauca</i>
d <i>Abies lasiocarpa</i>	<i>Vaccinium myrtillus</i>
<i>Pinus contorta</i>	<i>Pentaphylloides floribunda</i>
<i>Pinus flexilis</i>	<i>Betula glandulosa</i>
<i>Polemonium pulcherrimum</i>	<i>Festuca brachyphylla</i>
<i>Acomastylis rossii</i>	<i>Calamagrostis purpurascens</i>
<i>Artemisia scopulorum</i>	<i>Trisetum spicatum</i>
<i>Bistorta bistortoides</i>	<i>Poa</i> spp.
<i>Sibbaldia procumbens</i>	<i>Carex</i> spp.
<i>Potentilla diversifolia</i>	

- Arapaho NF, 11270 - 11700 ft. (Hess 1981, Wasser and Hess 1982, Komarkova and Gordon 1982)
- Roosevelt NF
- Pike NF, 11700 - 12300 ft. (Shepherd 1975)
- White River NF, 11600-11800 ft. (Hess and Wasser 1982)
- Gunnison NF, 12120 ft. (Komarkova 1986)

This seems to be a common timberline krummholz community. The association described by Shepherd (1975) includes, in addition, *Castilleja occidentalis*, *Mertensia ciliata*, *Chrysothamnus parryi*, *Carex* spp., and *Ribes montigenum*. Hess and Wasser's (1982) community also includes *Salix reticulata* spp. *nivalis*, *Carex siccata*, *Luzula spicata*, *L. parviflora*, *Poa nervosa*, *Cerastium arvense*, and *Erigeron pinnatisectus*.

Moir and Ludwig (1979) describe a near-timberline community, which they call Pienl/Acomastylis rossii, with Abia absent or occasional. This community occurs in nc Arizona, but no shrubs were mentioned. Henderson et al. (1977) also describe a Pienl/Acomastylis rossii with no Abia. These communities are apparently closely related to Pienl/Sagll, and are characterized by:

d Picea engelmannii	Ribes montigenum
a Abies lasiocarpa	Vaccinium sp.
Potentilla diversifolia	Carex albonigra
Oreochrysum parryi	Trisetum spicatum
Acomastylis rossii	Carex scirpoidea
Antennaria microphylla	Deschampsia cespitosa
Polemonium pulcherrimum	Luzula spp.
Sibbaldia procumbens	Festuca brachyphylla
Bistorta bistortoides	

CC

00316 Abia-Pienl/Setr

- Abies lasiocarpa-Picea engelmannii/Senecio triangularis p.a.
 = Abia/Streptopus amplexifolius h.t. (Henderson et al. 1977, Steele et al. 1981-1983, Cooper et al. 1983, Mauk and Henderson 1984)
 = Pienl/Setr h.t. (Hess 1981)

Warm, wet stream bottoms and bogs, moderate to steep slopes (10-55%), variable aspects, inundated by snowmelt runoff, drainage passages, but relatively well-drained by start of growing season, pH 5.4-6.0, 9400-11440 ft. in nc Colorado.

d Abies lasiocarpa	Vaccinium scoparium
d Picea engelmannii	V. myrtillus
Senecio triangularis	Carex aquatilis
Cardamine cordifolia	Calamagrostis canadensis
Trollius albiflorus	Carex disperma
Caltha leptosepala	Luzula parviflora
Smilacina stellata	Eleocharis quinqueflora
Streptopus fassettii	Scirpus microcarpus
Mitella pentandra	
Veronica nutans	
Moneses uniflora	
Equisetum arvense	
Mertensia ciliata	
Pedicularis groenlandica	
Polemonium pulcherrimum	

- Arapaho NF, 9400-11200 ft. (Hess 1981, Alexander 1981A, Wasser and Hess 1982, Crouch 1985)
- Roosevelt NF, 9480-11440 ft. (Peet 1975)
- White River NF (Terwilliger et al. 1979)
- Routt NF
- Shoshone NF
- c Idaho, 4500-8000 ft. (Steele et al. 1981, 1983)
- ne Utah, 8900-9960 ft. (Henderson et al. 1977, Mauk and Henderson 1984)
- n Idaho, 3300-6800 ft. (Cooper et al. 1983)
- Gunnison NF, 10100 ft. (Komarkova 1986)

This community was reported by Terwilliger et al. (1978) as Pienl/Setr, but Hess' (1981) study showed Pienl and Abia to apparently be codominant.

This p.a. was not reported by Hoffman and Alexander (1980) from the Routt NF, as it was by Terwilliger et al. (1979).

In the reports from Idaho and ne Utah, *Senecio triangularis* has greater constancy and cover than *Streptopus fassettii* in both cases. These communities also include:

s <i>Pinus contorta</i>	<i>Ribes lacustre</i>
<i>Orthilia secunda</i>	<i>Bromus canadensis</i>
<i>Micranthes odontoloma</i>	<i>Trisetum spicatum</i>
<i>Ligusticum filicinum</i>	
<i>Arnica latifolia</i>	

ALSO SEE: - Abia-Pienl/Meci

- Abia-Pienl/Caca

CC

00325

Abia-Pienl/Spbe

Abies lasiocarpa-*Picea engelmannii*/*Spiraea betulifolia* p.a.

= Abia/Spbe h.t. (Steele et al. 1981-1983)

= Abia/Vagl h.t. phase Spbe in part (Cooper 1975)

Warm, dry, usually on shallow to moderate (8-45%) slopes, variety of aspects, sedimentary or metamorphic substrates, pH 5.3-6.4, 5300-7600 ft.

d <i>Abies lasiocarpa</i>	<i>Spiraea betulifolia</i>
d <i>Picea engelmannii</i>	<i>Lonicera utahensis</i>
s <i>Pinus contorta</i>	<i>Paxistima myrsinites</i>
a <i>Pinus albicaulis</i>	<i>Amelanchier alnifolia</i>
s <i>Pseudotsuga menziesii</i>	
<i>Arnica cordifolia</i>	<i>Calamagrostis rubescens</i>
<i>Orthilia secunda</i>	<i>Carex geyeri</i>
<i>Thalictrum occidentale</i>	
<i>Osmorhiza chilensis</i>	
<i>Geranium viscosissimum</i>	
<i>Aster engelmannii</i>	

- c Idaho, 5300-7200 ft. (Steele et al. 1981)

- nw Wyoming, 6700-7600 ft. (Steele et al. 1979, Cooper 1975)

CC

00318

Abia-Pienl/Thoc

Abies lasiocarpa-*Picea engelmannii*/*Thalictrum occidentale* p.a.

= Abia/Thoc h.t. (Steele et al. 1979, Cooper 1975, Cole 1982)

Alluvial deposits, valley bottoms and north slopes, gentle to moderately steep (15-51%), all aspects, 7400-8900 ft., pH 5.1-7.0.

d <i>Abies lasiocarpa</i>	
d <i>Picea engelmannii</i>	
s <i>Pinus contorta</i>	
a <i>Pseudotsuga menziesii</i>	
a <i>Pinus albicaulis</i>	
s <i>Populus tremuloides</i>	

Pedicularis racemosa
Arnica cordifolia
Arnica latifolia
Hieracium gracile
Erigeron peregrinus
Disporum trachycarpum
Pseudostellaria jamesiana
Oreochrysum parryi
Orthilia secunda

Calamagrostis canadensis
Bromus canadensis
Festuca brachyphylla
Luzula parviflora
Poa reflexa
Trisetum spicatum
Agrostis hyemalis

- Roosevelt NF, 8400-10590 ft. (Peet 1975, Terwilliger et al. 1979, Komarkova and Gordon 1982, Wirsing 1970)
- Gunnison NF, 9000-11540 ft. (Kearmer and Stoecker 1980, Komarkova 1986)
- White River NF, 9400-9500 ft.
- San Juan NF, 8600-10600 ft. (De Velice et al. 1985)
- Rio Grande NF, 9800-11000 ft. (De Velice et al. 1985)
- San Isabel NF, 10500-11100 ft. (De Velice et al. 1985)
- n New Mexico, 9700-11600 ft. (De Velice et al. 1985)
- ec Arizona, 7750 ft. (Moir and Ludwig 1979)
- se New Mexico, 10000-11200 ft. (Fitzhugh et al., De Velice and Ludwig 1983)
- ec Utah, 10000-10600 ft. (Youngblood and Mauk 1985)

Fitzhugh et al. and De Velice et al. (1985) describe two phases: one with Ab1a-P1en1 codominant, and one with only P1en1. The second one is described under P1en1/Vamy.

Differs from Abila-Pien1/Vasc in the relative absence of Vaccinium scoparium, Sibbaldia procumbens, Bistorta bistortoides, Carex geyeri, Linnaea borealis, Caltha leptosepala, and Shepherdia canadensis. At higher elevations, Abila-Pien1/Vasc typically has Vasc and Vamy codominant (sometimes indistinguishable) in the understory. At lower elevations and south of central Colorado, Abila-Pien1/Vasc is usually represented by one of its phases, each of which is characterized by species not present in Abila-Pien1/Vamy.

Distegia involucrata in n Colorado is apparently replaced by *Lonicera utahensis* in New Mexico.

PHASE: 1. *Polemonium pulcherrimum* present, sometimes conspicuous, at higher elevations -- San Juan, Rio Grande, and San Isabel NF's; n New Mexico, 9960-11700 ft. (De Velice et al. 1985); Gunnison NF, 10590 ft. (Komarkova 1986)

ALSO SEE: Pien1/Vamy
Abla-Pien1/Vasc
Pien1/Vasc

00321 Abba-Pienl/Vasc

Abies lasiocarpa-*Picea engelmannii*/*Vaccinium scoparium* p.a.

- = Pien1-ABIE/Vasc assn. (Daubenmire 1952)
- = Ab1a-Vasc h.t. (Daubenmire and Daubenmire 1968)
- = Ab1a/Vasc h.t. (Pfister 1972, Wirsing & Alexander 1975, Hoffman & Alexander 1976-1980, Pfister et al. 1977, Henderson et al. 1977, Moir & Ludwig 1979, Steele et al. 1979-1981, Hoffman 1982, Cole 1982)

- = Abila/Shca h.t. (Hoffman & Alexander 1976) (see phase Shca)
- = Pienl/Vamy ph. *Polemonium delicatum* (Terwilliger et al. 1979) (see phase Popul)
- = Pienl/Vasc h.t. (Hess 1981)
- = Pienl-Abila/Vasc h.t. (Hess & Wasser 1982)
- = Abila/Popul h.t. (De Velice et al. 1983) (see phase Popul)

Most widespread p.a. in subalpine zone, sandy clay to sandy loam to clay loam soils with long winter snow duration, on a variety of slopes but best-developed on n aspect, pH 4.0-6.6, 5000-8500 ft. in Montana, 6500-9800 ft. in n Wyoming, and 7760-12500 ft. in central Colorado, 8800-11200 ft. in n New Mexico.

d <i>Abies lasiocarpa</i>	<i>Vaccinium scoparium</i>
d <i>Picea engelmannii</i>	<i>Vaccinium myrtillus</i>
s <i>Pinus contorta</i>	
s <i>Pseudotsuga menziesii</i>	
a <i>Pinus flexilis</i>	
<i>Arnica cordifolia</i>	<i>Carex geyeri</i>
<i>Chamerion angustifolium</i>	<i>Poa reflexa</i>
<i>Lupinus argenteus</i>	<i>Luzula parviflora</i>
<i>Fragaria</i> sp.	<i>Carex rossii</i>
<i>Potentilla diversifolia</i>	<i>Poa nervosa</i>
<i>Orthilia secunda</i>	
<i>Erigeron</i> spp.	
<i>Pedicularis racemosa</i>	
mosses	
lichens	

- A - Montana, 5000-8500 ft. (Pfister et al. 1977)
- Yellowstone NP (Romme 1979)
 - ne Utah, 8700-10700 ft. (Pfister 1972, Henderson et al. 1977, Mauk and Henderson 1984)
 - w Wyoming, 6240-9510 ft. (Cooper 1975, Oswald 1966)
 - e Washington, 6000-7500 ft. (Hall 1973)
 - ne Oregon, 6700-7600 ft. (Cole 1982)
 - Yellowstone NP (Romme 1979)
 - Shoshone NF, 6500-9800 ft. (Steele et al. 1983)
 - Bighorn NF, 7540-9280 ft. (Hoffman and Alexander 1976)
 - c Idaho, 6600-9200 ft. (Steele et al. 1981, Schlatterer 1972)

Associated vegetation include *Pinus albicaulis*, *Lonicera utahensis*, moss, *Calamagrostis rubescens*, *Antennaria racemosa*, *Potentilla diversifolia*. Fairly xeric sites on sand loam to clay loam soils. pH 4.0-5.8, 0-53% slopes.

- B - Medicine Bow NF, 7710-10600 ft. (Wirsing 1973, Wirsing and Alexander 1975, Oosting and Reed 1952, Hanna 1934, Knight & Thilenius 1975, Alexander et al. 1986)
- Roosevelt NF (Terwilliger et al. 1979, Hess 1981)

Mesic sites, with *Rosa woodsii*, *Ribes lacustre*, *Juniperus communis*, *Vaccinium cespitosum*, *Carex rossii*, *Trisetum spicatum*, *Poa nervosa*, *Erigeron peregrinus*, *Hieracium gracile*, *Noccaea montana*, *Pedicularis racemosa*, *Pedicularis bracteosa*, and *Erythronium grandiflorum*. *Populus tremuloides* is absent.

- C - Routt NF, 7760-10100 ft. (Bunin 1975, Hoffman and Alexander 1980)
- Roosevelt NF, 9000-11400 ft. (Peet 1975, Hess 1981, Wasser and Hess 1982, Vehlen 1986)
- Arapaho NF, 8800-11500 ft. (Klish 1977, Crouch 1985)
- White River NF, 9840-11600 ft. (Hess and Wasser 1982, Hoffman 1982)

Deeper soils, especially on n aspects, nearly level to steep slopes, more mesic than Abila-Pienl/Cagel, with *Mahonia repens*, *Agropyron* spp., *Calamagrostis canadensis*, *Bromus porteri*, *Paxistima myrsinites*, and *Thalictrum* sp.

- D - Gunnison NF, 8500-12500 ft. (Langenheim 1972, Komarkova 1986)
- San Juan NF, 9800-11880 ft. (Dix and Richards 1976)

Sandy clay or loam soils, with *Polemonium pulcherrimum*, *Linnaea borealis*, *Paxistima myrsinites*, and *Oreochrysum parryi*.

PHASES: 0. Typical Vasc phase, with a variety of mosses, especially *Brachythecium* and *Polytrichadelphus*, 6200-9800 ft. -- Shoshone NF (Steele et al. 1979); ne Utah, 8900-11000 ft. (Henderson et al. 1977; Mauk and Henderson 1984); nw Wyoming, 7400-9000 ft. (Cooper 1975); all other NF's except Black Hills NF and Nebraska NF; -- Medicine Bow NF (Alexander et al. 1986)

1. *Pinus albicaulis* at cold, coarse, well drained upper-elevation sites, transitional to P1al/Vasc, and alpine balds, with more *Carex rossii*, *Elymus glaucus*, *Erigeron peregrinus*, and *Lupinus* spp. -- Shoshone NF (Steele et al. 1979), Yellowstone NP (Romme 1979); -- nw Wyoming, 8600-9510 ft. (Cooper 1975).

2. *Polemonium pulcherrimum* phase; high elevations, with *Sibbaldia procumbens*, *Bistorta bistortoides*, and mosses, associated with *Draba crassifolia*, *Potentilla diversifolia*, *Ranunculus* spp., and *Senecio dimorphophyllus* -- Medicine Bow NF (Wirsing and Alexander 1975, Alexander et al. 1986); Roosevelt NF up to 11500 ft. (Peet 1975, Terwilliger et al. 1979).

3. *Carex geyeri* dominant in the understory on more xeric sites, with *Poa nemoralis*, *Erythronium grandiflorum*, *Paxistima myrsinites*, and *Pseudostellaria jamesiana*; and less moss cover -- Medicine Bow NF (Wirsing and Alexander 1975, Alexander et al. 1986), Roosevelt NF (Terwilliger et al. 1979, Hess 1981), and n Utah, 8700-10300 ft. (Henderson et al. 1977, Mauk and Henderson 1984). Terwilliger et al. also identified this phase on the Roosevelt, Arapaho, Routt, and White River NF's.

6. *Shepherdia canadensis* evident but not dominant, lower slopes and benches -- Bighorn NF, 8200-8400 ft. (Hoffman and Alexander 1976); nw Wyoming (Cooper 1975); Arapaho NF.

7. *Arnica cordifolia* very conspicuous at lower elevations and warmer sites than phase Vasc. -- White River NF and Routt NF. *Lathyrus leucanthus*, *Achillea lanulosa*, *Geranium richardsonii*, and *Salix scouleriana* (tall shrub) are also present -- nw Wyoming, 7900-8560 ft. (Cooper 1975). ALSO SEE Abila-Pienl/Arco2.

ALSO SEE: - Abila-Pienl/Vamy
 - Pienl/Vamy
 - Pienl/Vasc
 - Abila-Pienl/Rupa

Differs from Abila-Pien1/Vamy in the conspicuous presence of *Vaccinium scoparium* at higher elevations. At lower elevations or south of central Colorado, dominance by Vasc or Vamy is shared by one of the following: Cagel, Libo, Cale1, Shca, or Arco2. Thus, Abila-Pien1/Vamy is a distinct association; merger of the two into one, as "Abila-Pien1/VACC" or "Abila/VACC", does not appear to be justified.

CC

PICEA ENGELMANNII SERIES (004)

00401

Pien1/Arco2

Picea engelmannii/Arnica cordifolia p.a.

= PICE/Arco2 h.t. (Steele et al. 1979)

Gentle nw-e aspects, 7500-10000 ft., limestone-granite-volcanics-andesite, pH 4.2-7.1.

d *Picea engelmannii*
s *Pseudotsuga menziesii*
s *Pinus contorta*
s *Pinus flexilis* -- calcareous
Pinus albicaulis
s *Populus tremuloides*
Arnica cordifolia
Astragalus miser
Senecio streptanthifolius
Frasera speciosa

Leucopoa kingii
Carex rossii

- Shoshone NF (Steele et al. 1979, Alexander 1981A)

CC

00402

Pien1/Cale1

Picea engelmannii/Caltha leptosepala p.a.

= Abila/Cale1 h.t. (Henderson et al. 1977)

= PICE/Cale1 h.t. (Steele et al. 1979)

Cold sites along streambanks and terraces, 8200-9500 ft. in nw Wyoming, noncalcareous usually granitic alluvium, perpetually saturated, pH 5.3-6.1.

d *Picea engelmannii*
s *Pinus contorta*
s *Pinus albicaulis*
a *Abies lasiocarpa*
Picea pungens
Caltha leptosepala
Trollius albiflorus
Mitella pentandra
Senecio triangularis
Micranthes odontoloma
Veronica spp.
Parnassia fimbriata

Vaccinium scoparium
Kalmia polifolia
Phyllodoce empetriformis
Carex spp.
Juncus spp.
Calamagrostis canadensis
Luzula parviflora
Deschampsia cespitosa
Trisetum spicatum

- Shoshone NF, 8200-9500 ft. (Steele et al. 1983, Alexander 1981AB)

- w Wyoming

- ne Utah, 9200-10900 ft. (Henderson et al. 1977, Mauk and Henderson 1984)

Parnassia fimbriata
Aconitum columbianum
Aster spp.
Smilacina amplexicaulis
Osmorhiza chilensis
Micranthes odontoloma
Arnica cordifolia
Erigeron spp.
Swertia perennis
Thalictrum fendleri
Geranium richardsonii

Luzula parviflora
Elymus glaucus
Carex aquatilis
Bromus canadensis
Glyceria elata

- British Columbia (Pojar et al. 1984)
- Shoshone NF, 6200-8700 ft. (Steele et al. 1979, Alexander 1981AB)
- w Wyoming, 6000-8700 ft. (Youngblood and Mueggler 1981, Cooper 1975, Youngblood et al. 1985)
- ec Idaho (Steele et al. 1981)
- s Montana
- n Utah, near 9000 ft. (Mauk and Henderson 1984)
- s Utah, 8000-9000 ft. (Youngblood and Mauk 1985)

Pfister et al. (1977) reported a slightly different Pienl/Eqar p.a. from nw Montana. It is maintained separate from Abia-Pienl/Caca and from Abia-Pienl/Setr because of its description by Steele et al., and by Youngblood and Mueggler.

ALSO SEE: - Abia-Pienl/Caca
 - Abia-Pienl/Setr

CC
 00416 Pienl/Feth

Picea engelmannii/Festuca thurberi p.a.

= Piar/Feth h.t., in part (De Velice et al. 1985)

Steep upper slopes, west-facing slopes, thin rocky soils.

d *Picea engelmannii*
 a *Abies lasiocarpa*
 a *Pinus aristata*

Juniperus communis

Arnica cordifolia
Oreochrysum parryi
Chamerion angustifolium
Achillea lanulosa
Fragaria virginiana
Polemonium pulcherrimum

Festuca thurberi
Carex rossii
Poa fendleriana

- Rio Grande NF, 11200-11400 ft. (De Velice et al. 1985)

ALSO SEE: - Piar/Feth
 - Pienl/Arco2

CC
 00405 Pienl-Pipu/Gatr2

Picea engelmannii-*Picea pungens*/Galium triflorum p.a.

= PICE/Gatr2 h.t. (Pfister et al. 1977, Steele et al. 1981)

Warm, moist alluvial terraces-bottomlands-seeps, 6100-8200 ft., pH 6.0-8.1.

d <i>Picea engelmannii</i>	<i>Distegia involucrata</i>
d <i>Picea pungens</i>	
a <i>Abies lasiocarpa</i>	
s <i>Pinus contorta</i>	
s <i>Pseudotsuga menziesii</i>	
a <i>Populus tremuloides</i>	
<i>Galium triflorum</i>	<i>Calamagrostis canadensis</i> <i>Elymus glaucus</i>
<i>Actaea rubra</i>	
<i>Smilacina stellata</i>	
<i>Heracleum sphondylium</i>	
<i>Streptopus fassettii</i>	
<i>Senecio triangularis</i>	

- Shoshone NF (Steele et al. 1979, Alexander 1981AB)
- sc Montana (Pfister et al. 1977)
- nw Montana (Mace and Bissell 1986)
- w Wyoming, 5900-8200 ft. (Youngblood et al. 1985)
- ec Idaho (Steele et al. 1981)

CC	
00417	Pien1-Psme/Juco

Picea engelmannii-*Pseudotsuga menziesii*/*Juniperus communis* p.a.

d <i>Picea engelmannii</i>	<i>Juniperus communis</i>
s-d <i>Pseudotsuga menziesii</i>	<i>Acer glabrum</i>
s <i>Populus tremuloides</i>	
a <i>Pinus aristata</i>	
<i>Artemisia franserioides</i>	<i>Trisetum spicatum</i>
<i>Erigeron eximius</i>	<i>Carex rossii</i>
<i>Oreochrysum parryi</i>	
<i>Ciliaria austromontana</i>	

- n New Mexico, 10500-10800 ft. (De Velice et al. 1985)

ALSO SEE: - Pien1/Juco
- Psme/Juco

00407	Pienl/Juco
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Variety of topography, 7400-10300 ft., calcareous-volcanics-granitics, pH 5.1-7.3.

Picea engelmannii	Juniperus communis
s Pseudotsuga menziesii	
s Pinus flexilis	
s Pinus contorta	
Arnica cordifolia	Carex rossii
Astragalus miser	Poa nervosa
Solidago multiradiata	
Frasera speciosa	

- Shoshone NF (Steele et al. 1983, Alexander 1981AB)
- w Wyoming

There is no *Pinus albicaulis* in this p.a. Steele et al. (1983) also show no *Picea glauca* in this community; Pienl/Juco seems to be sharply distinct from Pigl/Juco.

ALSO SEE: - Pigl/Juco

- Abila-Pienl/Juco

CC
00406 Pienl/moss

Picea engelmannii/moss p.a.

= PICE/Hypnum revolutum h.t. (Steele et al. 1979)

= Pienl/Saxifraga bronchialis (Ciliaria austromontana) h.t., in part
(De Velice et al. 1985)

Steep n-aspects where snow persists, 7700-10500 ft., volcanics or sometimes limestone-granitics, pH 5.3-8.4.

d <i>Picea engelmannii</i>	<i>Juniperus communis</i>
a-d <i>Pseudotsuga menziesii</i>	
a <i>Pinus flexilis</i>	
moss spp.	<i>Carex rossii</i>
lichen spp.	
<i>Orthilia secunda</i>	
<i>Arnica cordifolia</i>	

A - Shoshone NF (Steele et al. 1979, Alexander 1981A)

- ec Idaho, 7300-8100 ft. (Steele et al. 1981)

s <i>Pinus flexilis</i>	<i>Shepherdia canadensis</i>
a <i>Pinus albicaulis</i>	<i>Symphoricarpos oreophilus</i>
<i>Orthilia secunda</i>	<i>Poa nervosa</i>

B - se New Mexico, 9500-10000 ft. (Fitzhugh et al.)

- se Arizona

- Pike NF, 9300 ft. (Radloff 1983)

- San Isabel NF, 9800-11300 ft. (De Velice et al. 1985)

- San Juan NF, 9950-11000 ft. (De Velice et al. 1985, Johnston & Hendzel 1985)

- Rio Grande NF, 11800 ft. (De Velice et al. 1985)

- Gunnison NF, 9740-10560 ft. (Komarkova 1986)

<i>Pinus strobiformis</i>	<i>Lonicera utahensis</i>
s <i>Populus tremuloides</i>	<i>Ribes montigenum</i>
a <i>Pinus aristata</i>	
<i>Pyrola chlorantha</i>	<i>Bromus canadensis</i>
<i>Fragaria virginiana</i>	<i>Festuca brachyphylla</i>
<i>Ciliaria austromontana</i>	

No vascular plant species in the understory has more than a slight cover (usually <1% on average).

ALSO SEE: - Abila-Pienl/moss

- Pienl-Psme/Juco

CC
00408 Pienl/Libo

Picea engelmannii/Linnaea borealis p.a.

= PICE/Libo h.t. (Pfister et al. 1977, Steele et al. 1979)

Alluvial terraces, well-drained benches, and gentle ne slopes at moderate elevations, on volcanics, limestone, and granite, 6200-8200 ft.

d <i>Picea engelmannii</i> s <i>Pinus contorta</i> <i>Pseudotsuga menziesii</i>	<i>Symphoricarpos albus</i> <i>Alnus sinuata</i> <i>Shepherdia canadensis</i> <i>Vaccinium globulare</i> <i>Juniperus communis</i> <i>Spiraea betulifolia</i>
<i>Linnaea borealis</i> <i>Arnica cordifolia</i> <i>A. latifolia</i> <i>Orthilia secunda</i> <i>Fragaria</i> spp. <i>Osmorhiza chilensis</i>	<i>Calamagrostis rubescens</i> <i>Carex geyeri</i> <i>Oryzopsis asperifolia</i>

- Shoshone NF (Steele et al. 1983)
- Montana (Pfister et al. 1977)

Succession usually progresses from Pico to Psme to Pienl. Several of the stands in the studies cited above were dominated by *Picea glauca* rather than *Picea engelmannii*. Pienl/Libo and Pigl/Libo have been separated here, because of geographical disjunction and different species in the understories. The two p.a.'s are very closely related.

ALSO SEE: - Abia-Pienl/Libo
- Pigl/Libo

CC
00409 Pienl/Phma

Picea engelmannii/*Physocarpus malvaceus* p.a.
= PICE/Phma h.t. (Pfister et al. 1977, Steele et al. 1979)

Primarily calcareous soils, n aspects, steep to gentle slopes, ca. 7200 ft. in nw Wyoming, 5900-7000 ft. in sc Montana.

<i>Picea engelmannii</i> s <i>Pseudotsuga menziesii</i> a <i>Abies lasiocarpa</i> s <i>Pinus contorta</i>	<i>Physocarpus malvaceus</i> <i>Symphoricarpos albus</i> <i>Spiraea betulifolia</i>
<i>Galium triflorum</i> <i>Disporum trachycarpum</i> <i>Thalictrum</i> sp. <i>Actaea rubra</i> <i>Linnaea borealis</i>	<i>Carex geyeri</i>

- Shoshone NF, ca. 7200 ft. (Steele et al. 1979, Alexander 1981AB)
- sc Montana, 5900-7000 ft. (Pfister et al. 1977)

This p.a. is apparently closely related to Pienl/Gatr p.a.

CC
00413 Pienl/Trda

Picea engelmannii/*Trifolium dasyphyllum* p.a.
= Pienl/Trpa p.a. (Terwilliger et al. 1979)

Immediately below krummholz timberline, moderately steep (20-45%) n aspects, colluvium mostly of granitic origin, pH 5.2-5.8, 10800-11400 ft.

d <i>Picea engelmannii</i>	<i>Vaccinium scoparium</i>
d <i>Abies lasiocarpa</i> (minor)	
<i>Pinus aristata</i>	
<i>Pinus flexilis</i>	
<i>Trifolium dasyphyllum</i>	<i>Trisetum spicatum</i>
<i>T. parryi</i>	<i>Festuca brachyphylla</i>
<i>Pyrola minor</i>	
<i>Eremogone fendleri</i>	
<i>Sedum lanceolatum</i>	

- Arapaho NF (Terwilliger et al. 1979, Hess 1981, Alexander 1981A, Wasser and Hess 1982, Hess and Alexander 1986)

- Roosevelt NF

CC

00418

Pienl/Vace

Picea engelmannii/Vaccinium cespitosum p.a.

- Pico/Vace c.t., in part (Mauk and Henderson 1984)

Sites dominated by cold-air drainage or accumulations; benches, slopes, and low plateaus; metamorphic substrates and sandstones; rocky surface, gravelly sandy loams to gravelly loams.

d <i>Picea engelmannii</i>	<i>Vaccinium cespitosum</i>
s <i>Pinus contorta</i>	<i>Vaccinium scoparium</i>
a-s <i>Populus tremuloides</i>	
a <i>Abies lasiocarpa</i>	
<i>Achillea lanulosa</i>	<i>Carex rossii</i>
	<i>Trisetum spicatum</i>

- n Utah, 9300-11100 ft. (Mauk and Henderson 1984)

Vaccinium scoparium may be more abundant; Pienl/Vace is distinguished from Pienl/Vasc by the constant presence of *Vaccinium cespitosum*.

ALSO SEE: - Pienl/Vasc

- Abia-Pienl/Vace

CC

00415

Pienl/Vamy

Picea engelmannii/Vaccinium myrtilus p.a.

- = Abia/Vamy h.t. phase Pienl (Fitzhugh et al.)

- = Pienl/Vamy/Popul h.t. phase Pienl (De Velice et al. 1985) (see phase Popul)

Slightly dryer than Abia-Pienl/Vamy, cobbly soils, 9400-11900 ft., 5-72% northerly slopes.

d <i>Picea engelmannii</i>	<i>Vaccinium myrtilus</i>
a <i>Abies lasiocarpa</i>	<i>Ribes montigenum</i>
	<i>Shepherdia canadensis</i>
<i>Polemonium pulcherrimum</i>	<i>Bromus canadensis</i>
<i>Orthilia secunda</i>	<i>Carex rossii</i>
<i>Pseudocymopterus montanus</i>	<i>Luzula parviflora</i>
<i>Ligularia amplexans</i>	

- San Isabel NF, 10900-11920 ft. (De Velice et al. 1985, Powell 1985)
- wc New Mexico, 9400-10200 ft. (Fitzhugh et al.)
- nc New Mexico, 10900-11900 ft. (Moir and Ludwig 1979)
- Rio Grande NF, 11700-11800 ft. (De Velice et al. 1985)
- n New Mexico, 11200-11800 ft. (De Velice et al. 1985)

ALSO SEE: - Ab1a-Pien1/Vamy
- Pien1/Vasc phase Popul

Picea engelmannii/Vaccinium scoparium p.a.

= PICE/Vasc h.t. (Steele et al. 1979)

= Abia/Popul h.t. phase Pien1 (De Velice et al. 1983) (see phase Popul1)

d *Picea engelmannii*

a *Abies lasiocarpa*

s *Pinus contorta*

Pinus flexilis

Picea pungens

a *Pseudotsuga menziesii*

Vaccinium scoparium

Ribes spp.

Distegia involucrata

Juniperus communis

Arnica cordifolia

Orthilia secunda

Erigeron peregrinus

Fragaria sp.

Senecio sanguisorbioides

Ligularia amplexans

Pedicularis racemosa

Polemonium pulcherrimum

Calamagrostis canadensis

Poa nervosa

Carex rossii

Deschampsia cespitosa

- 89

PHASES: 1. *Bistorta bistortoides* subdominant in herb layer, Vasc only shrub, Pial occasional, associated with *Pedicularis bracteosa*, *Potentilla diversifolia*, *Geranium richardsonii*, *Antennaria microphylla*, *Lupinus* spp., and *Solidago multiradiata* -- Shoshone NF, 8530-10800 ft. (Steele et al. 1979)

2. *Lupinus argenteus* conspicuous in herb layer, associated with *Rosa acicularis*, *Fragaria virginiana*, and *Senecio streptanthifolius*, 6600-8600 ft. on granite soils, pH 5.0-5.7 -- Bighorn NF (Hoffman and Alexander 1976)

5. *Polemonium pulcherrimum* subdominant with Vasc, associated with mosses. Arapaho NF, Roosevelt NF (Terwilliger et al. 1979) San Juan NF (Dix and Richards 1976). Mesic sites where snow lies longest, 10700 ft. to treeline. See also Abila-Pienl/Vasc phase Popul.

Hess (1981) considers Pienl/Vasc and Abila-Pienl/Vasc to be the same.

ALSO SEE: - Abila-Pienl/Vasc
- Pigl/Libo phase Vasc
- Pienl/Vamy
- Pienl/Vace

CC

PICEA GLAUCA SERIES (005)

00501

Pigl/Cape4

Picea glauca/Carex peckii p.a.

Upper canyons, north end of Black Hills. Cool, damp, n-e aspects. Soils rocky, with low to moderate clay content, moderately deep to deep.

d <i>Picea glauca</i>	<i>Juniperus communis</i>
<i>Pinus ponderosa</i>	
<i>Calypso bulbosa</i>	<i>Carex peckii</i>
<i>Aquilegia brevistyla</i>	<i>Leucopoa kingii</i>
<i>Fragaria</i> spp.	<i>Poa nemoralis</i>
<i>Geranium viscosissimum</i>	
<i>Viola pubescens</i>	
<i>Dodecatheon pulchellum</i>	

- Black Hills NF (Black Hills NF 1985)

ALSO SEE: - Pienl/Cadi

CC

00502

Pigl/Juco

Picea glauca/Juniperus communis p.a.

= Pipo-Pigl/Syal p.a. (Terwilliger et al. 1979)
= Pigl-Pipo/Juco h.t. (Black Hills NF 1982)

Cool, wet, uplands, silty loam soils, 17-57% n-w slopes, acid soils, pH 5.3-5.5

d <i>Picea glauca</i>	<i>Juniperus communis</i>
s <i>Pinus ponderosa</i>	<i>Vaccinium scoparium</i>
s <i>Populus tremuloides</i>	<i>Spiraea betulifolia</i>
a <i>Betula papyrifera</i>	<i>Mahonia repens</i>

	Arctostaphylos adenotricha Rosa acicularis
Zizia aptera Lathyrus ochroleucus Fragaria virginiana Galium septentrionale Orthilia secunda Achillea lanulosa Smilacina stellata	Oryzopsis asperifolia

- Black Hills NF, 5700-6700 ft. (Hayward 1928, Larson 1980, Black Hills NF 1985, Steinauer 1984)

Linnaea borealis is absent.

ALSO SEE: - Pien1/Juco

CC
00503 Pig1/Libo

Picea glauca/Linnaea borealis p.a.

- = Pig1-Vasc h.t. (Steinauer 1984, Hoffman 1985) (see phase Vasc)

Northerly moderately-steep (28-63%) slopes, loam soils, pH 5.4-7.3

d Picea glauca s Pinus ponderosa s-a Populus tremuloides	Juniperus communis Rosa acicularis Shepherdia canadensis Symphoricarpos albus Mahonia repens Arctostaphylos adenotricha Lonicera dioica
Linnaea borealis mosses Fragaria virginiana Viola adunca Hedysarum alpinum Antennaria plantaginifolia Galium septentrionale Lathyrus ochroleucus Zizia aptera	Oryzopsis asperifolia

- Black Hills NF, 5800-6430 ft. (Steinauer 1984, Hoffman 1985)

PHASES: 1. Vaccinium scoparium conspicuously codominant with Linnaea borealis at higher elevations and southerly exposures, silt loam or sandy loam; Pinus ponderosa absent, Juniperus communis less abundant, Shepherdia canadensis absent -- Black Hills NF, 6270-6350 ft. (Steinauer 1984, Hoffman 1985)

2. Spiraea betulifolia conspicuous over Linnaea borealis, at lower elevations, northerly exposures, loam soil, Pinus ponderosa seral, Juniperus communis and Vaccinium spp. less abundant, Clematis tenuiloba conspicuous -- Black Hills NF, 5950 ft. (Steinauer 1984)

ALSO SEE: - Pien1/Libo

00605

Picea pungens/*Alnus incana* spp. *tenuifolia* p.a.

- d *Picea pungens*
- a *Populus angustifolia*
- Populus balsamifera*
- a *Pseudotsuga menziesii*
- a *Pinus ponderosa*
- d *Abies concolor*

Alnus incana spp. tenuifolia
 Salix lutea
 Salix spp.
 Ribes inerme
 Rosa spp.
 Shepherdia canadensis
 Distegia involuocrata
 Symphoricarpos oreophilus

Fragaria virginiana
Fragaria vesca
Geranium richardsonii
Rudbeckia ampla
Heracleum sphondylium
Cardamine cordifolia
Hippochaete hiemalis

Calamagrostis canadensis
Poa spp.
Bromus canadensis
Carex foenea
Poa pratensis

- w Wyoming
- Shoshone NF, 7000-7500 ft. (Olson and Gerhart 1982)
- Rio Grande NF, 8550 ft. (De Velice et al. 1985)
- n New Mexico, 7880-8200 ft. (De Velice et al. 1985)
- Routt NF

ALSO SEE: - Pipu/Amal-Swse phase Swse
- Poan3/Alint-Swse

[illegible]

00601

Pipu/Amal-Swse

Picea pungens/Amelanchier alnifolia-Swida sericea p.a.

- = *Pipu/Amal-Cornus stolonifera*/Cagel h.t. (Hess & Wasser 1982)
= *PICE/Cornus stolonifera* c.t. (Youngblood et al. 1985)
= *Cornus stolonifera*/Gatr c.t. (Youngblood et al. 1985)

Cryoborolls and cryofluvents; stream benches and low slopes, valley bottoms, often influenced by cold-air drainage, well-drained soils, variety of aspects, 0-42% slopes, pH 7.6-8.1, 7220-8530 ft.

- d *Picea pungens*
- a *Abies* spp.
- d *Populus angustifolia*
- a *Juniperus scopulorum*
- a *Picea engelmannii*

Amelanchier alnifolia
Swida sericea
Acer glabrum
Padus virginiana
Symphoricarpos oreophilus
Rosa woodsii
Alnus spp.
Sambucus racemosa

Smilacina stellata
Thalictrum fendleri
Galium septentrionale
Osmorhiza depauperata

Carex geyeri
Bromus porteri
Elymus trachycaulus
Bromus canadensis

Calamagrostis canadensis
Glyceria striata
Poa pratensis

- PHASE: 1. *Swida sericea* (*Cornus stolonifera*) on more level sites, more mesic due to periodic high water tables, occasional flooding, with *Alnus incana* spp. *tenuifolia* -- White River NF (Hess and Wasser 1982). s Colorado-n New Mexico (De Velice et al. 1984).

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00602
Piru/Arco2

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= Pipu/Arco2-Smst p.a. (Terwilliger et al. 1979)

d *Picea pungens*
Abies lasiocarpa
s *Populus tremuloides*
Pseudotsuga menziesii
Pinus ponderosa

Arnica cordifolia
Achillea lanulosa
Fragaria virginiana
Galium septentrionale
Osmorhiza depauperata
Smilacina stellata

Carex foenea
Elymus trachycaulus
Bromus porteri
Carex disperma
Oryzopsis asperifolia
Calamagrostis canadensis

- | | |
|-------|----------------|
| 00608 | Pipu-Psme/Arad |
|-------|----------------|

= Pipu/Arctostaphylos uva-ursi h.t. (De Velice et al. 1985)

93

00607 Pipu-Psme/Erex

Picea pungens-Pseudotsuga menziesii/Erigeron eximius p.a.

= Pipu/*Fragaria ovalis* h.t. phase Erex (Fitzhugh et al. 1983)

Ridgetops and lower slopes, moderate to steep (50-68%) slopes, variety of aspects, moderately deep to deep soils, 8600-9500 ft.

d <i>Picea pungens</i>	
d <i>Pseudotsuga menziesii</i>	
a <i>Abies concolor</i>	
a <i>Pinus strobiformis</i>	
s <i>Populus tremuloides</i>	
a <i>Picea engelmannii</i>	
a <i>Abies lasiocarpa</i>	
<i>Erigeron eximius</i>	<i>Bromus canadensis</i>
<i>Fragaria virginiana</i>	
<i>Oreochrysum parryi</i>	
<i>Thalictrum fendleri</i>	

- Rio Grande NF, 8650 ft. (De Velice et al. 1985, Mathiasen et al. 1986)
- San Isabel NF
- n New Mexico, 8700-9500 ft. (De Velice et al. 1985)
- wc New Mexico, 8100-9100 ft. (Fitzhugh et al. 1983)

The s Colorado and n New Mexico communities (De Velice et al. 1984) also have *Paxistima myrsinites* and *Oreochrysum parryi*. The wc New Mexico communities (Fitzhugh et al. 1983) also have sral *Picea engelmannii* and *Koeleria macrantha*, *Carex foenea*, *Achillea lanulosa*, *Geranium richardsonii*, *Lathyrus arizonicus*, *Viola canadensis*, and *Pseudocymopterus montanus*. All have relatively sparse understories.

00609 Pisu-Psme/Fearl

Picea pungens-*Pseudotsuga menziesii*/*Festuca arizonica* p.a.

Warm, relatively dry, moderate to steep southerly slopes, also northerly at lower latitudes, warmest and driest of blue spruce forests, 16-59° slopes, 7500-9800 ft.

d <i>Picea pungens</i>	<i>Juniperus communis</i>
d <i>Pseudotsuga menziesii</i>	<i>Amelanchier alnifolia</i>
a <i>Pinus ponderosa</i>	
s <i>Populus tremuloides</i>	
a <i>Pinus strobiformis</i>	
a <i>Abies concolor</i>	
<i>Achillea lanulosa</i>	<i>Festuca arizonica</i>
<i>Lathyrus arizonicus</i>	<i>Poa fendleriana</i>
<i>Fragaria virginiana</i>	<i>Koeleria macrantha</i>
<i>Potentilla hippiana</i>	<i>Muhlenbergia montana</i>
<i>Antennaria rosea</i>	

- San Juan NF, 8380 ft. (De Velice et al. 1985)
- Rio Grande NF, 8850 ft. (De Velice et al. 1985)

- Moir and Ludwig (1979), *Abies concolor* is the next most important species, hence in this case would indicate lower succession rather than stratum. It is not true that Abco is seral to Pipu-Psme; the situation is very complex and difficult to classify. These communities are sometimes included in the "mixed conifer" series.

3. *Juniperus communis* evident, very sparse understory --
de Cristo Mountains, San Juan Mountains (Moir and Ludwig)

00610	Pipu-Psme/Mare
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Gentle (4-15%) lower slopes and benches, s-sw-facing, 7800-9000 ft.

- San Juan NF, 8250 ft. (De Velice et al. 1985)
- n New Mexico, 8200 ft. (De Velice et al. 1985)
- s Utah, 7800-9000 ft. (Youngblood and Mauk 1985)

00603	Pipu/POA
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Deep alluvial soils with black, mollic epipedon, streamside, moist hillsides, and wellwatered tributary draws, 8000-9300 ft. in New Mexico.

d <i>Picea pungens</i>	<i>Rosa</i> sp.
<i>Pseudotsuga menziesii</i>	<i>Salix scouleriana</i>
<i>Abies concolor</i>	<i>Padus virginiana</i>
s <i>Populus tremuloides</i>	<i>Symphoricarpos oreophilus</i>
a <i>Pinus strobiformis</i>	<i>Acer glabrum</i>
	<i>Distegia involucrata</i>
<i>Erigeron eximius</i>	<i>Poa secunda</i>
<i>Geranium richardsonii</i>	<i>Poa</i> spp.
<i>Achillea lanulosa</i>	<i>Bromus canadensis</i>
<i>Fragaria virginiana</i>	<i>Carex foenea</i>
<i>Thalictrum fendleri</i>	<i>Calamagrostis canadensis</i>
<i>Geum aleppicum</i>	<i>Carex lanuginosa</i>
<i>Geranium caespitosum</i>	<i>Carex microptera</i>

- Rio Grande NF (Moir and Ludwig 1979, Alexander 1981A)
- San Juan NF
- n-w New Mexico, 8000 ft. (Fitzhugh et al.)
- e Arizona
- San Isabel NF
- n New Mexico, 8840-9300 ft. (De Velice et al. 1985)

[illegible]

PINUS ALBICAULIS SERIES (007)

00701	Pial/Cagel
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Pinus albicaulis/Carex geyeri p.a.

High-elevation forests, steep (25-60%) s-w aspects or gentler slopes at lower elevations, 7300-9400 ft.

d <i>Pinus albicaulis</i> <i>Pseudotsuga menziesii</i>	<i>Symphoricarpos oreophilus</i>
a-d <i>Abies lasiocarpa</i>	
<i>Solidago multiradiata</i>	<i>Carex geyeri</i>
<i>Valeriana</i> sp.	<i>Festuca idahoensis</i>
<i>Achillea lanulosa</i>	<i>Stipa nelsoniana</i>
<i>Arnica cordifolia</i>	<i>Trisetum spicatum</i>
<i>Frasera speciosa</i>	<i>Poa nervosa</i>
<i>Erthrocoma triflora</i>	<i>Carex rossii</i>
<i>Antennaria microphylla</i>	<i>Elymus glaucus</i>
<i>Potentilla pulcherrima</i>	

- e Oregon, 6800-8000 ft. (Hall 1973)
- Shoshone NF (Steele et al. 1979, Alexander 1981B)
- nw Wyoming, 7300-9410 ft. (Cooper 1975)
- ne Idaho (Steele et al. 1981)
- c Idaho, above 8000 ft. (Schlatterer 1972)

Grasses and forbs predominate the aspect, rather than shrubs.

PHASES: 1. *Pinus contorta* conspicuously seral at lower elevations (7300-8100 ft.) and flat slopes, with more *Carex rossii*, *Danthonia intermedia*, *Antennaria rosea* -- nw Wyoming (Cooper 1975)

[illegible]

00702 P1a1/Caro3

Pinus albicaulis/*Carex rossii* p.a.

= P1a1/Cagel phase Pico, in part (Cooper 1975)

d Pinus albicaulis	
Abies lasiocarpa (minor)	
s Pinus contorta	
Picea engelmannii (minor)	
	Carex rossii
	Poa nervosa

- 00704 Pial/Feid
Pinus albicaulis/Festuca idahoensis p.a.

Pinus albicaulis	
Picea engelmannii	
Abies lasiocarpa	
s Pinus contorta	Festuca idahoensis

- 00705 *Pinus albicaulis/Juniperus communis* p.a. Pjal/Juco

d Pinus albicaulis	Juniperus communis
d Pinus contorta	Shepherdia canadensis
P. flexilis	Arctostaphylos adenotricha
Astragalus miser	
Arnica sp.	

- 00703 Pinal-Pifl/Podi
Pinus albicaulis-Pinus flexilis/Potentilla diversifolia p.a.

Pinus albicaulis	Vaccinium spp.
Pinus flexilis	

Potentilla diversifolia
 Erigeron eatonii
 Antennaria rosea
 Agoseris glauca
 Arnica cordifolia
 Lupinus sp.

Poa nervosa
 Carex rossii
 Trisetum spicatum

- Shoshone NF (Reed 1969)

This association, reported only by Reed (1969), was interpreted differently by Steele et al. (1979), who split it into two: Pial/Juco and Pial/Caro3. Cooper (1975) suggests that Pial-Pifl/Podi would better be seen as a phase of Pial/Vasc.

CC
 00706 Pial/Vasc

Pinus albicaulis/Vaccinium scoparium p.a.

= Abila-Pial/Vasc h.t. (Pfister et al. 1977)

Highest subalpine forest below timberline on protected sites, and on exposed ridges or s slopes below, 25-40% s-w facing slopes, droughty cold, gravelly loams to silts, acidic to very acidic surface, 7200-9000 ft. in Montana, 8500-10500 ft. in n Wyoming.

d Pinus albicaulis	Vaccinium scoparium
s Pinus contorta	Ribes montigenum
a Picea engelmannii	Juniperus communis
a-d Abies lasiocarpa	Juniperus horizontalis
Arnica cordifolia	Carex geyeri
Arnica latifolia	Poa nervosa
Thalictrum occidentale	Carex rossii
Hieracium gracile	Festuca idahoensis
Osmorhiza chilensis	Calamagrostis rubescens
Aster engelmannii	Roegneria spicata

- ne Oregon, 7600-8500 ft. (Cole 1982)
- Shoshone NF, 8500-10500 ft. (Reed 1976, Steele et al. 1979, Alexander 1981A, Wasser and Hess 1981, Forcella 1978)
- w Montana, 7200-9600 ft. (Pfister et al. 1977, Weaver & Dale 1974, Forcella 1978)
- c Idaho (Steele et al. 1981, Forcella 1978)
- s Idaho, 8560-9740 ft. (Cooper 1975)

ALSO SEE: - Pial-Abila h.t. (Daubenmire and Daubenmire 1968)

CC

PINUS ARISTATA SERIES (008)

00802

Piar/Fearl

Pinus aristata/Festuca arizonica p.a.

= Psme/Fearl phase Piar (De Velice et al. 1983)

Cold, dry, moderate to steep rocky slopes, all aspects, 30-67% slopes, well-drained rocky surface soils, 8200-10100 ft.

d Pinus aristata	Ribes cereum
a-s Populus tremuloides	Artemisia frigida
a-s Pseudotsuga menziesii	Clematis columbiana

a <i>Pinus flexilis</i>	
a <i>Picea pungens</i>	
<i>Artemisia franserioides</i>	<i>Festuca arizonica</i>
<i>Eremogone fendleri</i>	<i>Koeleria macrantha</i>
<i>Astragalus alpinus</i>	<i>Muhlenbergia montana</i>
	<i>Poa fendleriana</i>
	<i>Muhlenbergia filiculmis</i>
	<i>Danthonia parryi</i>
	<i>Elymus elymoides</i>

- Rio Grande NF, 9950 ft. (Shepherd 1975, De Velice et al. 1985)
- n New Mexico, 8620-10050 ft. (De Velice et al. 1985)
- San Isabel NF
- Pike NF, 9300-10100 ft.
- Gunnison NF, 9400-10000 ft. (Komarkova 1986)

CC
00801 Piar/Feth

Pinus aristata/*Festuca thurberi* p.a.
= Piar/Capul p.a. (Terwilliger et al. 1979)

Shallow, rocky soil on exposed ridges and steep southerly middle slopes (45-70%) at timberline and just below, above 10500 ft. in s Colorado.

d <i>Pinus aristata</i>	<i>Ribes montigenum</i>
a-d <i>Picea engelmannii</i>	
a <i>Pinus flexilis</i>	
<i>Ciliaria austromontana</i>	<i>Festuca thurberi</i>
<i>Senecio</i> spp.	<i>Calamagrostis purpurascens</i>
<i>Sedum lanceolatum</i>	<i>Carex</i> spp.
<i>Achillea lanulosa</i>	<i>Trisetum spicatum</i>
	<i>Poa fendleriana</i>
	<i>Festuca brachyphylla</i>

- Roosevelt NF (Terwilliger et al. 1979)
- Arapaho NF
- Pike NF
- Rio Grande NF, 10600-11600 ft. (De Velice et al. 1985)
- San Isabel NF, 11500 ft. (De Velice et al. 1985)
- n New Mexico, 10500 ft. (De Velice et al. 1985)
- Gunnison NF, 11900 ft. (Komarkova 1986)

Often with a park-like appearance, with widely-spaced trees.

ALSO SEE: - Piar/Fearl
- Pienl/Feth

CC
00805 Piar/Juco

Pinus aristata/*Juniperus communis* p.a.

Dry uplands and ridges with shallow soils, sparse undergrowth.

d <i>Pinus aristata</i>	<i>Juniperus communis</i>
	<i>Artemisia frigida</i>
<i>Artemisia dranunculus</i>	<i>Muhlenbergia montana</i>
	<i>Poa fendleriana</i>

- Gunnison NF, 10040 ft. (Komarkova 1986)

CC

Pinus aristata/Ribes montigenum p.a.

Scree slopes, 70% southerly slopes, sparse tree cover.

d <i>Pinus aristata</i>	<i>Ribes montigenum</i>
a <i>Picea engelmannii</i>	<i>Pentaphylloides floribunda</i>
	<i>Juniperus communis</i>
<i>Ciliaria austromontana</i>	<i>Festuca thurberi</i>
<i>Sedum lanceolatum</i>	<i>Poa fendleriana</i>
<i>Senecio atratus</i>	
<i>Senecio fendleri</i>	

- San Isabel NF, 11520 ft. (De Velice et al. 1985)

00803	Piar/Trda
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Pinus aristata/Trifolium dasyphyllum p.a.

Dense forest on dry, shallow, sandy soil with surface rocks, moderately steep (average 36%) s-se aspects, pH 5.6-6.2, exposed slopes and ridgetops, 11200-12100 ft.

d	Pinus aristata	Juniperus communis
	Picea engelmannii	
	Trifolium dasyphyllum	Carex foenea
	Achillea lanulosa	Poa abbreviata spp. pattersonii
	Penstemon whippleanus	Elymus scribneri
	Arnica cordifolia	Calamagrostis purpurascens
	Valeriana capitata	Trisetum spicatum
	Sedum lanceolatum	Carex elynoides
	Erigeron spp.	
	Senecio spp.	
	Artemisia spp.	
	Polemonium pulcherrimum	

- Arapaho NF, 11240-11650 ft. (Terwilliger et al. 1979, Hess 1981, Alexander 1981A, Wasser and Hess 1982, Hess and Alexander 1986)
- Pike NF, 11420-12100 ft. (Shepherd 1975)

ALSO SEE: - Pienl/Trda

[illegible]

PINUS CONTORTA SERIES (009)

00901	Pico/Arad
Pinus contorta/Arctostaphylos adenotricha p.a.	

Warm, dry, well-drained, sandy loam to loam soils derived from granite, below fir-spruce forest, warmest and driest of Pico p.a.'s, 7800-8200 ft. in n Wyoming, 10000-10600 ft. in s Colorado.

d <i>Pinus contorta</i>	<i>Arctostaphylos adenotricha</i>
a <i>Populus tremuloides</i>	<i>Juniperus communis</i>
a <i>Abies lasiocarpa</i>	<i>Spiraea betulifolia</i>
a <i>Pseudotsuga menziesii</i>	<i>Rosa woodsii</i>
	<i>Mahonia repens</i>
<i>Solidago spathulata</i>	<i>Carex rossii</i>

CC	
00911	Pico/Caro3

Pico/Caro3

d <i>Pinus contorta</i>	<i>Mahonia repens</i>
a <i>Picea engelmannii</i>	
a <i>Abies lasiocarpa</i>	
a <i>Pinus albicaulis</i>	

Arnica cordifolia	Carex rossii
Achillea lanulosa	Poa nervosa
Chamerion angustifolium	
Fragaria virginiana	
Potentilla diversifolia	
Solidago spathulata	
Orthilia secunda	
Lupinus argenteus	
Moss	

- Shoshone NF (Steele et al. 1983)
- nw Wyoming
- Medicine Bow NF, 8770-9470 ft. (Wirsing 1973, Alexander et al. 1986)
- n Utah, 9000-9700 ft. (Mauk and Henderson 1984)

The understory is very depauperate, and *Carex rossii* is the most conspicuous species, even though it is sparse.

00905	Pico/Juco
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= Pico/Juco c.t. (Steele et al. 1979, Mauk & Henderson 1984)

Warm, dry sites, most extensive on gentle benches, shallow to moderate depth loamy soils with scattered surface rock; 20-45% slopes; north and south slopes, 8400-9200 ft. in Colorado.

d <i>Pinus contorta</i>	<i>Juniperus communis</i>
s <i>Populus tremuloides</i>	<i>Arctostaphylos adenotricha</i>
a <i>Pseudotsuga menziesii</i>	<i>Rosa woodsii</i>
a <i>Pinus albicaulis</i>	<i>Shepherdia canadensis</i>
a <i>Picea engelmannii</i>	<i>Mahonia repens</i>
a <i>Abies lasiocarpa</i>	

Arnica cordifolia	Carex rossii
Drymocallis fissa	Carex geyeri
Thermopsis divaricarpa	
Lupinus argenteus	
Sedum lanceolatum	
Thalictrum fendleri	

- Medicine Bow NF (Knight & Thilenius 1975)
- Arapaho NF, 8360-9020 ft. (Hess 1981, Wasser and Hess 1982, Komarkova and Gordon 1982, Hess and Alexander 1986))
- Roosevelt NF
- Shoshone NF (Steele et al. 1983)
- c-e Idaho
- n Utah, 8000-10000 ft. (Mauk and Henderson 1984, Mueggler and Campbell 1986)
- Gunnison NF, 8600-10700 ft. (Komarkova 1985)

Alexander (1981B) states that Pico is here seral to some unknown climax. Understories are typically sparse, with *Juniperus communis* the most conspicuous species.

00907 Pico/Pone2
Pinus contorta/*Poa nervosa* p.a.

Variety of slopes and exposures, open dry forest floor, pH 5.3-5.7, 7900-9500 ft.

d <i>Pinus contorta</i>	<i>Shepherdia canadensis</i>
a <i>Picea engelmannii</i>	<i>Juniperus communis</i>
a <i>Abies lasiocarpa</i>	
<i>Arnica cordifolia</i>	<i>Poa nervosa</i>
<i>Chamerion angustifolium</i>	<i>Carex rossii</i>
<i>Antennaria rosea</i>	<i>Trisetum spicatum</i>
<i>Agoseris glauca</i>	<i>Carex geyeri</i>
<i>Astragalus miser</i>	

- Shoshone NF, 7900-9500 ft. (Reed 1976, Wasser and Hess 1982)
- ne Utah, 9200-9400 ft. (Henderson et al. 1977)

00908 Pico/Shca
Pinus contorta/*Shepherdia canadensis* p.a.
 = Pico/Shca c.t. (Steele et al. 1979)

Cool to warm, dry, well-drained gentle toeslopes and benches, sandy loam soils derived from sandstone or conglomerate, pH 5.0-6.3, 8400-9700 ft. in n Colorado.

d <i>Pinus contorta</i>	<i>Shepherdia canadensis</i>
a <i>Populus tremuloides</i>	<i>Vaccinium scoparium</i>
a <i>Pseudotsuga menziesii</i>	<i>Rosa woodsii</i>
a <i>Abies lasiocarpa</i>	<i>Juniperus communis</i>
a <i>Picea engelmannii</i>	<i>Linnaea borealis</i>
	<i>Mahonia repens</i>
	<i>Paxistima myrsinites</i>
	<i>Vaccinium myrtillus</i>
	<i>Arctostaphylos adenotricha</i>
<i>Arnica cordifolia</i>	<i>Carex rossii</i>
<i>Pyrola chlorantha</i>	<i>Carex geyeri</i>
<i>Oreochrysum parryi</i>	

- British Columbia (Pojar et al 1984)
- Roosevelt NF, 8400-9200 ft. (Steen and Dix 1974, Terwilliger et al. 1979, Hess and Alexander 1986)
- Arapaho NF (Hess 1981, Hayes and Aurd 1981)

- Routt NF, 9040-9700 ft. (Hoffman and Alexander 1980)
- w Wyoming (Oswald 1966)
- Shoshone NF (Steele et al. 1979)
- White River NF, 8690-9350 ft. (Hess and Wasser 1982, Wasser and Hess 1982)
- Medicine Bow NF (Knight & Thilenius 1975, Alexander et al. 1986)

In fact, Alexander (1981B) says that Pico here is seral to Abila-Pienl, except in central Colorado, where Pico is somewhere climax. There seem to be several communities here.

There is often a conspicuous layer of mosses and lichens in these communities.

PHASE: 1. Paxistima myrsinites-Vaccinium scoparium on more mesic sites with higher snowfall, Arctostaphylos adenotricha absent -- White River NF (Hess and Wasser 12/81).

ALSO SEE: - Abila-Pienl/Vasc phase Shca

CC
00912 Pico/Vace

Pinus contorta/Vaccinium cespitosum p.a.

= Pico/Vace c.t., in part (Mauk and Henderson 1984)

Dry sites in cold-air drainage pockets, quartzite or sandstone, weathered in place.

d Pinus contorta	Vaccinium cespitosum Juniperus communis
Fragaria virginiana	Carex rossii
Arnica cordifolia	Trisetum spicatum
Antennaria microphylla	Poa nervosa
Achillea lanulosa	

- n Utah, 8300-10000 ft. (Mauk and Henderson 1984)

ALSO SEE: - Abila-Pienl/Vace

- Pienl/Vace

CC
00909 Pico/Vamy

Pinus contorta/Vaccinium myrtilus p.a.

Steep (27-52%) slopes, canyons at midslope or lower slope, e-ne-facing, 8000-9200 ft. in n Colorado.

d Pinus contorta s Populus tremuloides	Vaccinium myrtilus Paxistima myrsinites Rosa sp. Juniperus communis Mahonia repens
Arnica cordifolia	Carex geyeri
Oreochrysum parryi	Bromus canadensis
Orthilia secunda	
Solidago sparsiflora	
Linnaea borealis	
Lathyrus leucanthus	
lichens	

- Gunnison NF
- Roosevelt NF, 8000-9200 ft. (Moir 1969)
- Arapaho NF, 9480-9800 ft. (Whipple and Dix 1979)

00910 Pico/Vasc

Pinus contorta/Vaccinium scoparium p.a.

- = Pico/Vasc c.t. (Wirsing & Alexander 1975, Winn 1976, Steele et al. 1979-1981, Cole 1982, Cooper et al. 1983, Mauk & Henderson 1984)

Cold, dry, excessively well-drained, more mesic than Pico/Aruv, all aspects on gentle slopes or ridges, sandy loams to silty loams to silt, pH 5.0-6.0, 6000-7700 ft. in Montana, 7700-9800 ft. in s Wyoming, 9000-10100 ft, in n Colorado.

d <i>Pinus contorta</i>	<i>Vaccinium scoparium</i>
a <i>Abies lasiocarpa</i>	<i>Juniperus communis</i>
a <i>Picea engelmannii</i>	<i>Rosa acicularis</i>
a <i>Populus tremuloides</i>	<i>Rosa woodsii</i>
<i>Pinus flexilis</i>	<i>Arctostaphylos adenotricha</i>
<i>Pinus ponderosa</i>	<i>Vaccinium myrtillus</i>
<i>Pseudotsuga menziesii</i>	<i>Mahonia repens</i>
<i>Pinus albicaulis</i>	
<i>Arnica cordifolia</i>	<i>Poa nervosa</i>
<i>Chamerion angustifolium</i>	<i>Calamagrostis rubescens</i>
<i>Lupinus</i> spp.	<i>Carex rossii</i>
<i>Solidago</i> spp.	<i>Carex geyeri</i>
<i>Linnaea borealis</i>	
Moss	

- Montana, 6000-7700 ft. (Pfister et al. 1977, Alexander 1981B)
- nc Idaho (Steele et al. 1981, Cooper et al. 1983)
- ne Oregon, 6000-7000 ft. (Alexander 1981B, Cole 1982)
- c Oregon, 5100-6400 ft. (Volland 1976)
- se Washington
- Shoshone NF (Steele et al. 1979)
- w Wyoming (Beetle 1961-1974)
- Bighorn NF (Hoffman and Alexander 1976)
- ne Utah, 8500-10000 ft. (Winn 1976, Henderson et al. 1977, Mauk and Henderson 1984)
- Medicine Bow NF, 7710-9800 ft. (Wirsing and Alexander 1975, Alexander et al. 1986)
- Roosevelt NF, 9000-10100 ft.. (Terwilliger et al. 1979, Steen and Dix 1974)
- Arapaho NF (Hess 1981, Wasser and Hess 1982, Hess and Alexander 1986)
- Gunnison NF, 10660 ft. (Komarkova 1986)

This is reported to be a "community of fire origin." Wirsing and Alexander (1975) reported this as a "community" within their Abia/Vasc h.t., to which it is related.

01002 Pifl/Capul

PINUS FLEXILIS SERIES (010)

01002

Pinus flexilis/Calamagrostis purpurascens p.a.

Pifl/Capul

Exposed windswept ridges and upper slopes, exposures and slopes variable, soil shallow-rocky-thin, pH 6.2-6.8, 9700-11000 ft.

d <i>Pinus flexilis</i>	
a <i>Picea engelmannii</i>	
a <i>Pinus contorta</i>	
<i>Eremogone fendleri</i>	<i>Calamagrostis purpurascens</i>
<i>Erigeron pinnatisectus</i>	<i>Carex rossii</i>
<i>Pulsatilla patens</i>	<i>Poa glauca</i>
<i>Sedum lanceolatum</i>	<i>Trisetum spicatum</i>
<i>Lupinus argenteus</i>	
<i>Erigeron compositus</i>	
<i>Geranium caespitosum</i>	
<i>Potentilla pulcherrima</i>	

- Arapaho NF (Hess 1981, Alexander 1981A, Wasser and Hess 1982, Hess and Alexander 1986)
- Roosevelt NF (Terwilliger et al. 1979)

CC
01007 Pifl/Cele

Pinus flexilis/Cercocarpus ledifolius p.a.

Upper slopes and ridgetops, southerly and westerly aspects, open canopies, rocky slopes.

d <i>Pinus flexilis</i>	<i>Cercocarpus ledifolius</i>
a <i>Pseudotsuga menziesii</i>	<i>Artemisia tridentata</i>
a <i>Juniperus scopulorum</i>	<i>Mahonia repens</i>
	<i>Symphoricarpos oreophilus</i>
	<i>Paxistima myrsinites</i>
<i>Balsamorhiza sagittata</i>	<i>Leucopoa kingii</i>
<i>Achillea lanulosa</i>	<i>Roegneria spicata</i>
	<i>Poa nervosa</i>
	<i>Melica bulbosa</i>
	<i>Koeleria macrantha</i>

- nw Utah, 7000-8000 ft. (Mauk and Henderson 1984)
- Bighorn NF, 7000-7300 ft.
- ec Idaho, 7000-8400 ft. (Steele et al. 1981)
- e Idaho, 6000-8500 ft. (Steele et al. 1983)
- s Utah, 9000 ft. (Youngblood and Mauk 1985)

ALSO SEE: - Psme/Cele

CC
01003 Pifl/Feid

Pinus flexilis/Festuca idahoensis p.a.

Texture gravelly, sandy loam to silt, moderate surface rock and bare soil, pH slightly basic on calcareous parent material, neutral to slightly acid on other substrate, 4100-8500 ft.

d <i>Pinus flexilis</i>	<i>Artemisia tridentata</i>
d <i>Pseudotsuga menziesii</i>	<i>Symphoricarpos oreophilus</i>
a-d <i>Juniperus scopulorum</i>	<i>Juniperus communis</i>
<i>Antennaria microphylla</i>	<i>Festuca idahoensis</i>
<i>Balsamorhiza sagittata</i>	<i>Roegneria spicata</i>
<i>Achillea lanulosa</i>	<i>Leucopoa kingii</i>

- Montana, 4100-8200 ft. (Pfister et al. 1977)
- Shoshone NF, 7700-8500 ft. (Steele et al. 1979)
- c Idaho, 6600-8300 ft. (Steele et al. 1981)

ALSO SEE: - Abco-Pif1/Fear1

Pinus flexilis/Festuca thurberi p.a.

= *Pif1/Ciliaria austromontana* h.t. (Komarkova 1986)

d *Pinus flexilis*
a *Pseudotsuga menziesii*

Symphoricarpos oreophilus

Rosa woodsii

Juniperus communis

Ciliaria austromontana

Fragaria virginiana

Achillea lanulosa

- Gunnison NF, 9005 ft. (Komarkova 1986)

ALSO SEE: - Pif1/Juco

01005	Pif1/Juc
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Pinus flexilis/Juniperus communis p.a.

= Pif1/Arctostaphylos uva-ursi (De Velice et al. 1985)

Warm, dry, windswept ridges or high steep slopes, snow blows off early, mostly on se-sw slopes, skeletal well-drained cryic soils, sandy loam to gravelly loam with accumulated duff, sometimes on limestone, pH 3.6-7.6, 7000-9500 ft. in n Wyoming, 8300-10080 ft. in n Colorado.

d *Pinus flexilis*

a *Pinus contorta*

s-d Pseudotsuga menziesii

s-a Populus tremuloides

a *Pinus ponderosa*

a-s *Picea engelmannii*

Juniperus communis

Arctostaphylos adenotricha

Shepherdia canadensis

Rosa woodsii

Jamesia americana

Mahonia repens

Astragalus sp.

Arnica cordifo

Thermopsis divaricarpa

Sedum lanceolatum

Eremogone fendleri

Drymocallis fissa

Lupinus argenteus

Moss

Leucopoa kingii

Calamagrostis purpurascens

Carex rossii

Muhlenbergia filiculmis

Festuca Idahoensis

A - sc Montana, 7600-8300 ft. (Pfister et al. 1977)

Mostly on limestone, pH around 7.1. This p.a. is reported to have few grasses, but associates include *Juniperus horizontalis*.

Clematis pseudoalpina, *Aster conspicuus*, and *Galium septentrionale*. *Pseudotsuga menziesii* is said to share dominance. This seems to be related to *Psme/Juco*.

- B - Shoshone NF, 7000-9500 ft. (Steele et al. 1979, Alexander 1981B)
 - Medicine Bow NF (Alexander et al. 1986)
 - nw Routt NF, 8300-8580 ft. (Hoffman and Alexander 1980)
 - Roosevelt NF, 8450-10080 ft. (Peet 1975, Wasser and Hess 1982, Komarkova and Gordon 1982, Hess and Alexander 1986)
 - Arapaho NF, 8400-9500 ft. (Hess 1981)
 - c Idaho, 8000-9200 ft. (Steele et al. 1981)
 - San Isabel NF, ca. 9650 ft. (De Velice et al. 1985)
 - n New Mexico, 10100-10400 ft. (De Velice et al. 1985)
 - Gunnison NF, 9400 ft. (Johnston and Hendzel 1985)
 - s Utah (Youngblood and Mauk 1985)

On somewhat more acid soils, pH 3.6-7.6, with some grasses and grasslike plants, associated with *Arctostaphylos adenotricha*, and very different forbs, as described above. Sparse to very sparse understories. This seems to be related to *Pifl/Leki* in Colorado.

ALSO SEE: - *Pifl/Juco*
 - *Psme/Arad-Juco*

CC
 01008 Pifl/Juho

Pinus flexilis/Juniperus horizontalis p.a.
 = *Pifl/Agropyron spicatum* h.t. (Girard 1985)

Stony soils, steep upper slopes and ridges.

d <i>Pinus flexilis</i>	<i>Rhus aromatica</i> spp. <i>trilobata</i>
a <i>Juniperus scopulorum</i>	<i>Juniperus horizontalis</i>
	<i>Schizachyrium scoparium</i>
	<i>Carex</i> spp.
	<i>Calamovilfa longifolia</i>
	<i>Roegneria spicata</i>

- sw North Dakota (Girard 1985)

ALSO SEE: - "*Pifl/Scsc*" on escarpments, Pawnee NG.

CC
 01004 Pifl/Leki

Pinus flexilis/Leucopoa kingii p.a.

Dry, exposed, stony slopes (60-78%) or ridgetops with coarse soils, windswept, se-sw aspects, pH 7.0-7.5, 5200-9200 ft. in n Wyoming, 8400-9800 ft. in s Wyoming.

d <i>Pinus flexilis</i>	<i>Artemisia tridentata</i>
s <i>Pinus contorta</i>	<i>Ribes cereum</i>
a <i>Abies lasiocarpa</i>	<i>Juniperus communis</i>
s <i>Populus tremuloides</i>	<i>Symphoricarpos oreophilus</i>
a-d <i>Pseudotsuga menziesii</i>	<i>Mahonia repens</i>
<i>Juniperus scopulorum</i>	
<i>Eremogone congesta</i>	<i>Leucopoa kingii</i>
<i>Erigeron flagellaris</i>	<i>Roegneria spicata</i>
<i>Antennaria rosea</i>	<i>Koeleria macrantha</i>

Roegneria spicata
Leucopoa kingii
Oryzopsis hymenoides
Koeleria macrantha
Bouteloua gracilis

- Montana, up to 6600 ft. (Pfister et al. 1977)
- nw Wyoming (Cooper 1975)
- sw North Dakota (Whitman 1979)

ALSO SEE: - Pif1/Juco
- Pif1/Juho

01006 Pif1/Trda

Pinus flexilis/Trifolium dasyphyllum p.a.

Just below treeline, moderately steep (30-55%) s aspects, high mountain slopes, windy desiccating climate, granitic soils, pH 5.4-6.8, 10500-11500 ft.

d Pinus flexilis
Abies lasiocarpa
a Picea engelmannii

Trifolium dasyphyllum
Mertensia viridis
Eremogone fendleri
Cilicaria austromontana
Polemonum pulcherrimum
Acomastylis rossii
Heterotheca villosa
Heuchera parvifolia
Penstemon whippleanus
Pulsatilla patens
Oreoxis alpina

Juniperus communis
Pentaphylloides floribunda
Salix glauca
Calamagrostis purpurascens
Festuca brachyphylla
Carex elynoides
Carex foenea

- Arapaho NF (Hess 1981, Wasser and Hess 1982, Komarkova and Gordon 1982, Hess and Alexander 1986)
- Roosevelt NF (Terwilliger et al. 1979)

ALSO SEE: - Ab1a-Pien1/Sag11.

[illegible]

PINUS PONDEROSA SERIES (011)

01140

Pipo/Arad

Pinus ponderosa/Arctostaphylos adenotricha p.a.

= *Pipo/Arctostaphylos uva-ursi* h.t. (Wirsing 1973, De Velice et al. 1985, Hoffman 1986)

Gentle to steep lower slopes and ridges, all aspects, moderately deep to lithic soils, very dry and well-drained, variety of textures, pH 4.7-6.7

d Pinus ponderosa
a Pseudotsuga menziesii
s Populus tremuloides

Arctostaphylos adenotricha
Rosa woodsii

Antennaria rosea
Geranium caespitosum
Achillea lanulosa

Muhlenbergia montana
Carex heliophila
Koeleria macrantha
Elymus elymoides
Poa fendleriana
Danthonia parryi

- Medicine Bow NF (Wirsing 1973, Alexander et al. 1986)
- San Isabel NF, 8400-9000 ft. (De Velice et al. 1985)
- ne New Mexico, 7700-9100 ft. (De Velice et al. 1985)
- Black Hills NF, 5080-6700 ft. (Hoffman 1986)
- Pike NF, 7200 ft. (Livingston 1949)

Except for *Arctostaphylos adenotricha*, the undergrowth is often sparse. The Black Hills community (Hoffman 1986) also has *Symphoricarpos albus*, *Spiraea betulifolia*, *Oryzopsis asperifolia*, *Fragaria virginiana*, and *Lathrus ochroleucus*.

ALSO SEE: - Psme/Arad

[illegible]

01129

Ріро/Аграз

Pinus ponderosa/Arctostaphylos patula p.a.

Warm and dry, gentle to moderate middle to lower slopes, benches, and ridges, often southerly aspects. Mostly sedimentary substrates, colluvial or alluvial origin, sand to silt loam, 7500-8500 ft.

d Pinus ponderosa
Juniperus scopulorum
a Pinus flexilis

Arctostaphylos patula
Purshia tridentata
Mahonia repens
Carex rossii
Leymus salinae

Eriogonum racemosum

- s-se Utah, 7200-8500 ft. (Youngblood and Mauk 1985, Graybosch and Buchanan 1983)

- wc Colorado

PHASE: 1. *Cercocarpus montanus* prominent on lower, alluvial slopes adjacent to washes -- se Utah, 7220-7550 ft. (Graybosch and Buchanan 1983). No *Pinus flexilis*; more *Amelanchier utahensis* and less *Leymus salinae*.

ALSO SEE: - Psme/Arpa3

- Pipo/Feid ph. Arpa3

- Pipo/Cemo

- Abco-Psme/Arpa3

[illegible]

01131

Pi po/Arno

Pinus ponderosa/Artemisia nova p.a.

Lower timberline, lower slopes and benches, variety of aspects, mostly colluvium derived from basalt, shallow gravelly loams to silty loams.

d Pinus ponderosa
a Juniperus scopulorum
a Pinus flexilis

Artemisia nova
Chrysothamnus viscidiflorus
Purshia tridentata

Eriogonum racemosum
Picradenia richardsonii

Bouteloua gracilis
Koeleria macrantha
Poa fendleriana

- s Utah, 8000-9000 ft. (Youngblood and Mauk 1985)

CC
 01104 Pipo/Bocu

Pinus ponderosa/*Bouteloua curtipendula* p.a.

= Pipo/Jusc h.t. (Hoffman 1986)

Rough, stoney land and canyon rims on exposures of limestone and limey sandstone, pH 7.3, sandy loams.

d *Pinus ponderosa*
 a *Juniperus scopulorum*

Rhus aromatica spp. *trilobata*
Toxicodendron rydbergii
Prunus besseyi
Prunus melanocarpa
Gutierrezia sarothrae

Pulsatilla patens
Aster ciliolatus
Campanula rotundifolia

Bouteloua curtipendula
Schizachyrium scoparium
Stipa comata
Bouteloua gracilis
Oryzopsis micrantha

- Nebraska National Forest (Terwilliger et al. 1979)

- sc South Dakota (Tolstead 1941)

- Black Hills NF, 3900 ft. (Hoffman 1986)

CC
 01127 Pipo/Bogr

Pinus ponderosa/*Bouteloua gracilis* p.a.

= Pipo/Bogr h.t. phase Bogr (De Velice et al. 1984)

Plateaus and low slope angles, high amount of exposed soil, all aspects, gentle to steep slopes, 6200-8600 ft.

d *Pinus ponderosa*
 a-d *Pinus edulis*
 a *Juniperus monosperma*
 a *Juniperus osteosperma*

a *Quercus gambelii*

Heterotheca fulcrata
Solidago spp.
Artemisia carruthii

Bouteloua gracilis
Poa fendleriana
Koeleria macrantha
Elymus elymoides
Muhlenbergia montana

- n New Mexico, 6500-8500 ft. (De Velice et al. 1985, Francis 1986)

- n Arizona, 6300-7500 ft. (Hanks et al. 1983)

- San Juan NF, 8620 ft. (De Velice et al. 1985)

- se Arizona, 7150 ft. (De Velice and Ludwig 1983)

PHASES: 2. *Andropogon hallii* on cinder-ash soils -- n Arizona, 6600-7000 ft. (Hanks et al. 1983)

3. *Artemisia tridentata* evident on limestone substrates -- n Arizona (Hanks et al. 1983)

4. *Pinus edulis* evident on driest sites -- n Arizona, 6300-7100 ft. (Hanks et al. 1983)

ALSO SEE: - Pipo/Scsc
- Pipo-JUNI/Bogr

Pinus ponderosa-Juniperus/Bouteloua gracilis p.a.

= Pipo/Bogr h.t. (Fitzhugh et al. 1983)

normal upland in southern Rocky Mount.

Normal upland in southern Rocky Mountains, 2-28% slopes, variable aspects, shallow soils.

d Pinus ponderosa	Quercus X undulata (grisea)
d Juniperus spp.	Quercus gambelii
Geranium caespitosum	Bouteloua gracilis
Pterogonum alatum	Elymus elymoides
	Blepharoneuron tricholepis
	Poa fendleriana

Terwilliger's key (1979) states that Fearl is said to be "present but clearly subordinate." This community seems very all-inclusive, but still is obviously shrub-dominated. It is likely that there are at least two identifiable associations here, Pipo-Jusc/Cemo and Pipo-Jusc/Putr.

d Juniperus scopulorum	Chrysothamnus nauseosus
d Juniperus monosperma	Cercocarpus montanus
	Purshia tridentata
	Ribes cereum
	Rosa spp.
Picradenia richardsonii	Schizachyrium scoparium
Heterotheca villosa	Sporobolus cryptandrus
Castilleja spp.	Elytrigia smithii
Vicia americana	Aristida longiseta
Allium spp.	Bouteloua curtipendula

- San Juan NF
- se Arizona

This community is grass-dominated; the shrubs are clearly subordinate.

d Juniperus deppeana		
d Pinus edulis		
Lotus wrightii	+	Aristida arizonica
Erigeron flagellaris		Carex spp.
Bahia dissecta		
Sphaeralcea coccinea		

01105	Pino/Cage1
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Pinus ponderosa/*Carex geyeri* p.a.

Gentle slopes, 15% n-slopes, dry rocky loam soils, pH 6.4, warm, dry, lower elevations on deep, well-drained, sandy loam to clay loam soil, with much gravel in profile.

Amelanchier alnifolia
Arctostaphylos adenotricha
Juniperus communis
Mahonia repens
Symphoricarpos oreophilus
Quercus gambelii

Carex geyeri
Leucopoa kingii
Poa nervosa

- Medicine Bow NF, 6150-8480 ft. (Wirsing and Alexander 1975, Alexander et al. 1986)
- Routt NF, 7200 ft. (Bunin 1975)
- Arapaho NF (Terwilliger et al. 1979)
- Roosevelt NF
- ne Utah, 7200-8300 ft. (Henderson et al. 1977, Mauk and Henderson 1984)
- White River NF, 7250 ft. (Boyce 1977)
- e Oregon, 4000-6200 ft. (Hall 1973)

This p.a. was not included from the Arapaho or Roosevelt NF by Hess (1981).

B - Thunder Basin NG

On different sites, shale soils.

PHASES: 1. *Lupinus argenteus* conspicuous, associated with *Mahonia repens*, *Cirsium canescens*, *Apocynum androsaemifolium*, and *Arctostaphylos* -- Medicine Bow NF (Wirsing and Alexander 1975).

2. *Sedum lanceolatum* conspicuous, with no *Lupinus*, *Mahonia*, or *Cirsium* -- Medicine Bow NF (Wirsing and Alexander 1975).

ALSO SEE: - Psme/Cage1

01126 Pipo/Cahel

Pinus ponderosa/Carex heliophila p.a.

Rocky ridges and dry southerly slopes, foothills on borders and ridges in the plains, 5800-7400 ft., precipitation ca. 20 in/yr, granodiorite substrate. Sandy loams to loamy sands, pH 5.8-6.9.

Artemisia frigida
Rosa arkansana
Rhus aromatica spp. trilobata
Ribes cereum

Carex heliophila
Sporobolus cryptandrus
Hesperochloa kingii
Schizachyrium scoparium
Poa secunda
Stipa spp.

- The North Dakota and Montana communities have more *Roegneria spicata*. The Colorado communities have more *Carex pityophila*, *Muhlenbergia montana*, *Bouteloua gracilis*, *Gernaum caespitosum*, *Leucopoa kingii*, *Eriogonum umbellatum*, *Penstemon virens*, *Harbouria trachypleura*, and *Allium cernuum*.

CC	
01106	Pino/Caro3

Gentle to moderately sloping (0-40%) hills, n aspects at lower elevations to s aspects higher, variety of parent materials, pH 6.0-6.7, 6200-9400 ft.

Juniperus communis
Cercocarpus montanus
Ribes cereum
Purshia tridentata

Carex rossii
Muhlenbergia montana
Leucopoa kingii
Koeleria macrantha

- | | |
|-------|-----------|
| 01132 | Pino/Cele |
|-------|-----------|

117

d Pinus ponderosa	Cercocarpus ledifolius
d-a Juniperus scopulorum	Symphoricarpos oreophilus
a Pinus edulis	
a Pseudotsuga menziesii	
a Juniperus osteosperma	
Erigonum racemosum	Sitanion hystrix

- s Utah, 6800-8100 ft. (Youngblood and Mauk 1985)

01107	Pipo/Cemo
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Pinus ponderosa/Cercocarpus montanus p.a.

Dry rocky hillsides just above shrubland, shallow, rocky loam soils, se-sw aspects in lower montane zone, moderate to steep slopes (18-60%), 5570-7400 ft.

d <i>Pinus ponderosa</i>	<i>Cercocarpus montanus</i>
a <i>Pseudotsuga menziesii</i>	<i>Artemisia frigida</i>
a <i>Juniperus scopulorum</i>	<i>Opuntia polyacantha</i>
a <i>Pinus edulis</i>	<i>Yucca glauca</i>
	<i>Rhus aromatica</i> spp. <i>trilobata</i>
	<i>Quercus gambelii</i>
<i>Artemisia ludoviciana</i>	<i>Carex rossii</i>
<i>Eriogonum umbellatum</i>	<i>Elytrigia dasystachya</i>
<i>Geranium caespitosum</i>	<i>Stipa comata</i>
<i>Leucocrinum montanum</i>	<i>Koeleria macrantha</i>
<i>Cystopteris fragilis</i>	<i>Bouteloua gracilis</i>
<i>Allium textile</i>	<i>Muhlenbergia montana</i>
<i>Heterotheca villosa</i>	<i>Schizachyrium scoparium</i>
<i>Erysimum asperum</i>	<i>Festuca arizonica</i>
<i>Helianthus pumilus</i>	
<i>Echinocereus viridiflorus</i>	

- Arapaho NF (Peet 1975, Terwilliger et al. 1979, Hess 1981, Hess and Alexander 1986)
- Roosevelt NF, 6230-7380 ft. (Wasser and Hess 1982)
- Pike NF, 7800 ft. (Terwilliger et al. 1979, Radloff 1983)
- n New Mexico, 8600 ft. (De Velice et al. 1985)
- ne Colorado (Bunin 1986)

ALSO SEE: - Pipo/Arpa3 phase Cemo

CC	
01115	Pipo-Jusc/Cemo

Pinus ponderosa-Juniperus scopulorum/Cercocarpus montanus p.a.

- = Pipo-Jusc/Cemo/Syal/Scsc habitat unit (Thilenius 1972)
- = Pipo-Jusc/Syal p.a. (Terwilliger et al. 1979)
- = Pipo/Cemo/Jusc h.t. (Black Hills NF 1982)

Low elevation, more xeric ponderosa pine sites, sw-se slopes, precip. 18-20 in/yr, limestone soils, 5000-5500 ft.

Pinus ponderosa	Cercocarpus montanus
Juniperus scopulorum	Rhus aromatica spp. trilobata
	Padus virginiana
	Juniperus communis
	Symphoricarpos albus

	Rosa woodsii
	Ribes inebrians
	Artemisia frigida
	Yucca glauca
	Amelanchier alnifolia
Lupinus parviflorus	Schizachyrium scoparium
Achillea lanulosa	Elytrigia dasystachya
Artemisia ludoviciana	Koeleria macrantha
Phlox hoodii	Bouteloua curtipendula
Galium septentrionale	Poa sp.
Zigadenus elegans	Carex concinna
Pulsatilla patens	Carex foenea
Tetranneuris acaulis	Bouteloua gracilis

- Black Hills NF (Thilenius 1972, Larson 1980, Wasser and Hess 1982, Black Hills NF 1985)

01108 Pipo/Dain

Pinus ponderosa/Danthonia intermedia p.a.
= Pipo/Popr-Dain habitat unit (Thilenius 1972)

Shale, granite, or limestone, precip. 18-20 in/yr, 4950-5500 ft.

Pinus ponderosa	Symphoricarpos albus
	Rosa woodsii
	Symphoricarpos occidentalis
	Amelanchier alnifolia
	Ribes inebrians
	Padus virginiana
	Pentaphylloides floribunda
Achillea lanulosa	Danthonia intermedia
Monarda fistulosa	Poa pratensis
Clematis hirsutissima	Koeleria macrantha
Campanula rotundifolia	Elytrigia dasystachya
Galium septentrionale	Carex foenea
Viola adunca	
Antennaria neglecta	
Apocynum androsaemifolium	

- Black Hills NF (Thilenius 1972, Larson 1980, Black Hills NF 1985)

Not included or discussed in Hoffman (1985-1986).

01109 Pipo/Fearl

Pinus ponderosa/Festuca arizonica p.a.

Cool, wet rocky slopes and benches, meadows or little openings interspersed, southern and southwestern Colorado at lowest elevations of the ponderosa pine zone, 3-42% slopes (often <10%), soils low in coarse fragments, variable aspects, 5400-9600 ft.

d Pinus ponderosa	Ribes cereum
a Juniperus scopulorum	Symphoricarpos oreophilus
a Pinus edulis	Mahonia repens
a Pseudotsuga menziesii	Artemisia frigida
	Ceanothus fendleri
	Holodiscus dumosus
	Quercus spp.

Festuca arizonica
Muhlenbergia montana
Carex heliophila
Koeleria macrantha
Carex filifolia
Poa fendleriana

- n New Mexico, 7900-8900 ft. (De Velice et al. 1985)
- Pike NF, 7700-8900 ft. (Radloff 1983)
- San Isabel NF, 9300-9800 ft. (De Velice et al. 1985)
- Rio Grande NF, 8600-9700 ft. (Shepherd 1975, De Velice et al. 1985)
- Colorado-New Mexico-Arizona (Clary 1978)
- sw New Mexico, 7400-8720 ft. (Fitzhugh et al. 1983)
- n Arizona, 5400-9200 ft. (Hanks et al. 1983, Harris & Covington 1983, Arnold 1950, White 1985, Glendenning 1944, Ogden 1984)
- Gunnison NF, 9880-9950 ft. (Komarkova 1986)

This usually has little to no *Pseudotsuga*, and occurs on flat or gentle terrain, moderately well-drained. There may be a transitional zone to the adjacent *Pipo/Mumol*, with conspicuous (to codominant) *Pseudotsuga*, on greater slopes with better drainage. Both *Pipo/Fearl* and *Pipo-Psme/Mumol* have *Festuca arizonica* and *Muhlenbergia montana* co-subdominant on many sites.

PHASES: 1. *Danthonia parryi* conspicuous on gentler slopes (12-20%), with more *Carex* spp., *Koeleria macrantha*, *Poa fendleriana*, *Elymus elymoides*, *Antennaria rosea*, and *Potentilla* spp. -- Rio Grande NF and n New Mexico, 7900-9500 ft. (De Velice et al. 1984); Pike NF.

2. *Bouteloua gracilis* present, sometimes abundant on drier sites, tendency to lower elevations, gentle aspects, shallower soils, with more *Carex* spp. and less *Ceanothus fendleri*, more *Schizachyrium scoparium*, *Pinus edulis*, *Artemisia ludoviciana*, *Eriogonum flagellaris*, and *Heterotheca villosa* -- Rio Grande NF and n New Mexico. 7400-8600 ft. (De Velice et al. 1985)

ALSO SEE: - Pipo/Cemo phase Fear1
- Pipo-Psme/Mumol
- Abco-Psme/Fear1
- Psme/Fear1
- Pipo-JUNI/Bogr

CC					
01110					Pipo/Feid

Pinus ponderosa/Festuca idahoensis p.a.

- = Pipo-Feid h.t. (Daubenmire & Daubenmire 1968)
- = Pipo/Putr/Feid phase Feid (Dealy 1971)
- = Pipo/Arpa3/Feid (Dealy 1971) (see phase Arpa3)

Well-drained loamy sand or sandy loam, gentle s-w aspects, pH 5.5-6.7.
less than 5000 ft. in Montana, 4300-6000 ft. in n Wyoming.

d Pinus ponderosa
a Pseudotsuga menziesii
a Populus tremuloides
a Juniperus scopulorum

Artemisia tridentata
Ribes cereum
Rhus aromatica spp. trilobata
Padus virginiana

a <i>Pinus flexilis</i>	<i>Symphoricarpos oreophilus</i> <i>Mahonia repens</i> <i>Purshia tridentata</i>
<i>Balsamorhiza sagittata</i>	<i>Festuca idahoensis</i>
<i>Cerastium arvense</i>	<i>Roegneria spicata</i>
<i>Cystopteris fragilis</i>	<i>Carex rossii</i>
<i>Achillea lanulosa</i>	<i>F. scabrella</i>
<i>Geranium caespitosum</i>	<i>Leucopoa kingii</i>
<i>Antennaria microphylla</i>	<i>Koeleria macrantha</i>

- c Oregon, 4700-6500 ft. (Dealy 1971, Buckhouse and Mattison 1980)
- e Oregon, 2500-5500 ft. (Hall 1973)
- se Montana, 4000-4100 ft. (Pfister et al. 1977, Hansen and Hoffman 1986)
- e Washington
- c Idaho, 3500-5800 ft. (Steele et al. 1981)
- n Idaho, 2000-5800 ft. (Cooper et al. 1983)
- Bighorn NF, 4300-5970 ft. (Hoffman and Alexander 1976)
- nc Wyoming (Terwilliger 1979)
- nw Colorado
- Gunnison NF, 8760 ft. (Komarkova 1986)
- ne Utah, 7100-8400 ft. (Henderson et al. 1977, Mauk and Henderson 1984)

PHASE: 1. *Arctostaphylos patula* on moderately-steep slopes with severe exposures, more *Juniperus communis* and *Sedum lanceolatum* -- ne Utah, 8100-8900 ft. (Henderson et al. 1977, Mauk and Henderson 1984), c Oregon, 4900-6500 ft. (Dealy 1971)

The c Oregon communities have more *Carex rossii* and *Stipa occidentalis*. The eastern Montana communities have conspicuous *Carex heliophila*, *Bouteloua curtipendula*, and *Artemisia ludoviciana* (Hansen and Hoffman 1986). The Gunnison NF community has more *Carex geophila*, *Lupinus argenteus*, and *Potentilla hippiana*.

CC	Pipo/Juco
01112	

Pinus ponderosa/Juniperus communis p.a.

Silt loam, shallow soil, pH 5.1-6.8.

d Pinus ponderosa	Juniperus communis
s Populus tremuloides	Ribes cereum
	<u>Mahonia repens</u>
Agoseris glauca	Leucopoa kingii
Astragalus miser	Poa nemoralis
Lomatium ambiguum	
Clematis tenuiloba	

- se Bighorn NF, ca. 7680 ft. (Hoffman and Alexander 1976)
- Black Hills NF, 4575-6525 ft. (Hoffman 1986)
- sw North Dakota, 4000-4080 ft. (Hansen and Hoffman 1986)

The North Dakota community has large quantities of *Carex heliophila*. In the Black Hills NF community, there is more *Arctostaphylos adenotricha*, *Symphoricarpos albus*, *Spiraea betulifolia*, and *Fragaria virginiana*.

ALSO SEE: - Psme[-Pipo]/Juco
- Psme/Aruv-Juco

[illegible]

01113	Pipo/Juco-Syal
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Pinus ponderosa/Juniperus communis-Symphoricarpos albus p.a.

= Pipo/Juco/Syal/Berberis repens habitat unit (Thilenius 1972)

= Pipo/Juco h.t. (Larson 1980, Black Hills NF 1982, Hoffman 1985)

Mesic uplands, limestone plateau, 5670-6780 ft. Higher elevation, moist, cool sites (in Black Hills).

Pinus ponderosa
s Populus tremuloides
a Picea glauca

Juniperus communis
Symphoricarpos albus
Shepherdia canadensis
Padus virginiana
Rosa woodsii
Amelanchier alnifolia
Spiraea betulifolia
Ribes inebrians
Mahonia repens
Arctostaphylos adenotricha

Achillea lanulosa
Fragaria vesca
Galium septentrionale
Viola adunca
Vicia americana
Lathyrus ochroleucus
Campanula rotundifolia
Antennaria neglecta
Zizia aptera

Oryzopsis asperifolia
Danthonia intermedia
Poa pratensis
Carex concinna
Elytrigia dasystachya
Carex foenea
Carex heliophila
Stipa viridula

- Black Hills NF (Thilenius 1972, Larson 1980, Wasser and Hess 1982, Black Hills 1985, Hoffman 1985)

ALSO SEE: - Pig1/Juco

- Pipo/Dain

[illegible]

01111	Pipo/Leki
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Pinus ponderosa/Leucopoa kingii p.a.

= Pipo/Hesperochloa kingii h.t. (Hess 1981)

Variety of exposures, relief, and slopes. Typically, non-southerly gentle to moderate slopes. Most mesic Pipo p.a., metamorphic and igneous substrates, pH 5.8-6.6, 7200-8600 ft.

d Pinus ponderosa
Pseudotsuga menziesii
Juniperus scopulorum

Ribes cereum
Artemisia frigida

Geranium caespitosum
Harbouria trachypleura
Senecio fendleri
Artemisia ludoviciana

Leucopoa kingii
Koeleria macrantha

- Roosevelt NF (Terwilliger et al. 1979, Hess 1981, Wasser and Hess 1982, Hess and Alexander 1986)

- ne Colorado, 5700-6000 ft. (Bunin 1986)

- Pinus ponderosa*-*Pseudotsuga menziesii*/*Muhlenbergia montana* p.a.
 = Pipo/Mufil p.a. (Terwilliger et al. 1979)
 = Pipo/Mumol h.t. (Hess 1981, Fitzhugh et al., De Velice et al. 1985, Youngblood 1984)
 = Psme/Fearl h.t. (Fitzhugh et al.)
 = Psme/Mumol h.t. (Fitzhugh et al.)

Moderately shallow soils, semi-open slopes, gently sloping ridges, benches, exposed rocky hilltops, and uplands, 7400-10200 ft., soils derived from granite, variety of aspects (usually not nw-ne), 10-55% slopes.

d <i>Pinus ponderosa</i>	<i>Artemisia frigida</i>
d-a <i>Pseudotsuga menziesii</i>	<i>Ribes cereum</i>
a <i>Pinus flexilis</i>	<i>Rubus deliciosus</i>
a <i>Juniperus scopulorum</i>	<i>Cercocarpus montanus</i>
a <i>Pinus strobiformis</i>	<i>Purshia tridentata</i>
a <i>Pinus edulis</i>	<i>Arctostaphylos adenotricha</i>
a <i>Juniperus monosperma</i>	<i>Symphoricarpos oreophilus</i>
a <i>Juniperus osteosperma</i>	
<i>Artemisia ludoviciana</i>	<i>Muhlenbergia montana</i>
<i>Geranium caespitosum</i>	<i>Festuca arizonica</i>
<i>Achillea lanulosa</i>	<i>Leucopoa kingii</i>
<i>Heterotheca villosa</i>	<i>Poa fendleriana</i>
<i>Drymocalis fissa</i>	<i>Bouteloua gracilis</i>
<i>Picradenia richardsonii</i>	<i>Koeleria macrantha</i>
<i>Eriogonum umbellatum</i>	<i>Muhlenbergia filiculmis</i>
<i>Solidago canadensis</i>	<i>Elytrigia dasystachya</i>
<i>Pseudocymopterus montanus</i>	<i>Carex rossii</i>
	<i>Bromus lanatipes</i>
	<i>Carex</i> spp.
	<i>Blepharoneuron tricholepis</i>

- ne Colorado (Bunin 1986)
- Roosevelt NF, 7870-8780 ft. (Peet 1975, Hess 1981, Wasser and Hess 1982, Komarkova and Gordon 1982, Reid and Love 1951, Hess and Alexander 1986)
- Pike NF, 8300-9100 ft. (Terwilliger et al. 1979, Radloff 1983)
- Rio Grande NF, 7550-9480 ft. (Shepherd 1975)
- n New Mexico, 7620-9500 ft. (De Velice et al. 1985)
- San Juan NF
- sw New Mexico, 7540-10200 ft. (Fitzhugh et al.)
- se Arizona
- sc Utah, 7100-8800 ft. (Youngblood and Mauk 1985)

The shrub layer is sparse to very sparse; total forb cover is typically low. Shepherd (1975) and Komarkova and Gordon (1982) say that *Psme* is codominant in this association; perhaps the name Pipo-*Psme*/Mumol is more appropriate. *Festuca arizonica* drops out farther north, to be replaced by *Leucopoa kingii* and *Elytrigia*. *Pinus ponderosa* becomes less important farther south, but still apparently retains its codominance. On the other hand, Hess (1981), De Velice et al. (1985) and Fitzhugh et al. (1983) describe a Pipo/Mumol with little or no *Pseudotsuga menziesii*, and increased *Bouteloua gracilis* or *Blepharoneuron tricholepis*.

PHASES: 1. *Ceanothus fendleri* conspicuous, with *Quercus gambelii*, *Ribes cereum*, *Mahonia repens*, *Shepherdia canadensis*, *Arctostaphylos*, and *Physocarpus* in the shrub layer. A variety of grasses and forbs present -- San Isabel NF (Terwilliger et al. 1979).

2. *Elytrigia dasystachya* more abundant on very steep slopes and poorly-developed soils -- Roosevelt NF (Hess 1981)

ALSO SEE: - Pipo/Fearl

- Abco-Psme/Fearl

CC
01122 Pipo/Pavi

Pinus ponderosa/*Padus virginiana* p.a.

- = Pipo-Quma/Prvi/Syal/Berberis repens (Thilenius 1972) (see phase Quma)
- = Pipo-Quma/Prvi/Syal/Scpu-Cafo (Thilenius 1972) (see phase Quma)
- = Pipo/Prvi h.t. (Terwilliger 1979, Pfister et al. 1977)
- = Pipo-Quma/Syal p.a. (Terwilliger et al. 1979) (see phase Quma)
- = Pipo/Quma p.a. phase *Berberis repens* (Larson 1980) (see phase Mare)
- = Pipo/Quma p.a. phase Prvi (Larson 1980) (see phase Quma)
- = Pipo/Quma/Mare h.t. (Black Hills NF 1982) (see phase Quma)
- = Pipo/Prvi/Quma h.t. (Black Hills NF 1982) (see phase Quma)
- = Pipo/Quma h.t. (Hoffman 1985) (see phase Quma)
- = Pipo/Syal h.t., in part (Hoffman 1986)

Low-elevation, moist n-facing slopes and draws, calcareous or non-calcareous gravelly silt loam to silt soil, precip. 20-22 in/yr, pH 6.0-9.0.

d *Pinus ponderosa*
a *Ostrya virginiana*
a *Fraxinus pennsylvanica*

Padus virginiana
Symphoricarpos albus
Juniperus communis
Rosa woodsii
Amelanchier alnifolia
Mahonia repens
Ribes lacustre

Achillea lanulosa
Fragaria sp.
Galium septentrionale
Viola adunca
Arnica cordifolia
Vicia americana
Lathyrus ochroleucus
Disporum trachycarpum
Maianthemum canadense
Sanicula marilandica
Monarda fistulosa
Cystopteris fragilis

Oryzopsis asperifolia
Danthonia intermedia
Carex foenea
Poa sp.
Agrostis hyemalis
Carex heliophila
Schizachne purpurascens

- Black Hills NF, 5125-5440 ft. (Thilenius 1972, Larson 1980, Wasser and Hess 1982, Black Hills NF 1985, Hoffman 1985)
- se Montana, 3900-4400 ft. (Pfister et al. 1977, Hansen and Hoffman 1986)
- nc Wyoming (Terwilliger 1979)
- nw Nebraska, 4200-4400 ft.

d Pinus ponderosa	Quercus gambelii
d Pinus edulis	Amelanchier alnifolia
a Juniperus osteosperma	Symphoricarpos spp.
a Juniperus scopulorum	Padus virginiana
	Rosa spp.
	Artemisia frigida
	Cercocarpus montanus
	Mahonia repens
	Ribes inerme
Solidago spp.	Carex spp.
Achillea lanulosa	Koeleria macrantha
Erigeron spp.	Poa fendleriana
Galium spp.	Muhlenbergia montana
	Elymus elymoides
- San Juan NF, 7300-9500 ft. (Steinhoff 1978)	
- n New Mexico, 6790-8950 ft. (De Velice et al. 1985)	

ALSO SEE: - Pipo/Quga

[illegible]

01120

Pipo/Putr

Pinus ponderosa/*Purshia tridentata* p.a.

= Pipo/Putr assn. (Daubenmire 1952)

= Pipo-Putr h.t. (Daubenmire & Daubenmire 1968)

= Pipo-Putr-Caro3 (Hall 1973)

= Pipo/Putr/Feid (Dealy 1971, Hopkins & Kovalchik 1983)

Well-drained dry benches, dry slopes, 10-55% predom. s aspects, sandy loams, pH 5.0-6.6, up to 6500 ft. in c Idaho, 7500-8900 ft. in nc Colorado.

d <i>Pinus ponderosa</i>	<i>Purshia tridentata</i>
a <i>Pseudotsuga menziesii</i>	
a <i>Juniperus scopulorum</i>	
a <i>Populus tremuloides</i>	
<i>Achillea lanulosa</i>	<i>Carex rossii</i>

A - c Oregon, 2900-6500 ft. (Volland 1976, Dealy 1971, Dyrness and Youngberg 1966, Hopkins and Kovalchik 1983)

- c Montana (Pfister et al. 1977)

- e Washington (Daubenmire and Daubenmire 1968)

- c Idaho, 3000-6500 ft. (Steele et al. 1981)

	Amelanchier alnifolia
	Prunus virginiana
	Symphoricarpos albus
Balsamorhiza sagittata	Roegneria spicata
	Festuca idahoensis
	Stipa spp.

B - Roosevelt NF, 6500-8900 ft. (Peet 1975, Hess 1981, Wasser and Hess 1982, Komarkova and Gordon 1982, Hess and Alexander 1986)

- c-e Oregon, 4500-5900 ft. (Hall 1973, Volland 1976)

Ribes cereum
Artemisia frigida
Juniperus communis
Arctostaphylos adenotricha

Heterotheca villosa

Stipa viridula
Elytrigia smithii
Carex geyeri

- nc Montana (Mackie 1970, Komberec 1976, Knowles 1975-1986)
- Montana, below 4800 ft. (Pfister et al. 1977)
- n-c Idaho, 3300-5100 ft. (Steele et al. 1981)
- e Washington
- Bighorn NF, ca. 6000 ft. (Hoffman and Alexander 1976)
- Thunder Basin NG (Steward 1984)

ALSO SEE: - Pipo/Rosp

CC
01102 Pipo/Scsc-Elsm

Pinus ponderosa/Schizachyrium scoparium-Elytrigia smithii p.a.

- = Pipo/Ansc habitat unit (Thilenius 1972)
- = Pipo/Ansc-Bogr habitat unit (Thilenius 1972)
- = Pipo/ANDR h.t. (Pfister et al. 1977, Terwilliger 1979, Terwilliger et al. 1979)
- = Pipo/Agsm p.a. (Larson 1980)

Rocky breaks, hills and canyons, and watercourses, precipitation 18-20 in/yr, 4800-5500 ft., pH 7.2-8.0, often derived from limestone.

d Pinus ponderosa	Rhus aromatica spp. trilobata
a-d Juniperus scopulorum	Yucca glauca
Achillea lanulosa	Schizachyrium scoparium
Phlox hoodii	Elytrigia smithii
Allium spp.	Bouteloua gracilis
	Carex foenea
	Stipa comata

- Black Hills NF (Thilenius 1972, Larson 1980, Wasser and Hess 1982, Black Hills NF 1985)
- Nebraska NF, 4200-4400 ft.
- se Montana, ca. 4000 ft. (Pfister et al. 1977)
- ne Colorado, 5700-6000 ft. (Bunin 1986)

Shrubs sometimes with Rosa woodsii and Symphoricarpos albus, often on limestone, associated with Antennaria rosea, Zizia aptera, Lathyrus ochroleucus, Lupinus parviflorus, and Artemisia ludoviciana.

This p.a. probably does not exist on Thunder Basin NG; see Pipo/Rosp p.a.

In Colorado, Andropogon gerardii, Carex heliophila, Ribes cereum, and Artemisia ludoviciana are also common (Bunin 1986).

ALSO SEE: - Pipo/Ansc

CC
01128 Pipo/Scsc

Pinus ponderosa/Schizachytium scoparium p.a.

- = Pipo/Bogr h.t. phase Schizachyrium scoparium (De Velice et al. 1984)
- = Pipo/Quun h.t. (De Velice et al. 1985) (see phase Quun)
- = Pipo/Orhy h.t. (De Velice et al. 1985)

d Pinus ponderosa
d-a Pinus edulis
a Juniperus scopulorum
a Juniperus monosperma
Heterotheca fulcrata

- San Juan NF
- Rio Grande NF
- n New Mexico. 6000-8100 ft. (De Velice et al. 1985)

01123	Pipo/Spbe
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Spiraea betulifolia
Symphoricarpos albus
Mahonia repens
Padus virginiana
Juniperus communis

Festuca idahoensis
Leucopoa kingii
Poa palustris
Poa nemoralis
Carex foenea

01124	Pino/Sval
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- = Pipo/Syal/Arctostaphylos uva-ursi habitat unit (Thilenius 1972)
- = Pipo/Syal h.t. (Daubenmire & Daubenmire 1968, Terwilliger 1979)
- = Pipo/Syal/Arctostaphylos uva-ursi h.t. (Black Hills NF 1982)

131

s *Betula papyrifera*
a *Pseudotsuga menziesii*

Juniperus communis
Padus virginiana
Amelanchier alnifolia
Spiraea sp.
Arctostaphylos adenotricha
Rosa woodsii

Achillea lanulosa
Campanula rotundifolia
Fragaria sp.
Apocynum androsaemifolium
Galium septentrionale
Solidago occidentalis
Viola adunca
Antennaria neglecta

Poa fendleri
Oryzopsis asperifolia
Danthonia intermedia
Carex concinna
Elytrigia dasystachya
Carex spp.

- n Idaho, below 3500 ft. (Cooper et al. 1983, Rickard 1960)
- c Idaho, below 5000 ft. (Steele et al. 1981)
- c-se Montana, 2600-5400 ft. (Pfister et al. 1977)
- Black Hills NF, 3720-6000 ft. (Thilenius 1972, Larson 1980, Wasser and Hess 1982, Black Hills NF 1985, Hoffman 1986, Krantz 1971)
- Nebraska NF
- nc Wyoming (Terwilliger 1979)

This seems to be very similar to Pipo/Spbe.

PHASES: 2. *Oryzopsis asperifolia* conspicuous, on more acid soils, often sandy loams -- Black Hills NF, 4500-4700 ft. (Hoffman 1986)

3. *Mahonia repens* conspicuous, with more *Spiraea betulifolia*, and *Arctostaphylos adenotricha* and less *Juniperus communis*. *Betula papyrifera* is common in seral aspen stands. --Black Hills NF, 4950 ft. (Krantz 1971, Hoffman 1986)

01150	Pipo-Jusc/Svoc
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Pinus ponderosa-Juniperus scopulorum/Symphoricarpos occidentalis p.a.

Moderate slopes (0-15%) of gently-rolling buttes, ponderosa pine parkland, all aspects, mostly shale or sandstone derived, loam and silt loam. pH 8.0-8.2

d Pinus ponderosa
Juniperus scopulorum

Symphoricarpos occidentalis
Padus virginiana
Rhus aromatica spp. trilobata
Juniperus horizontalis
Juniperus communis

Toxicodendron rydbergii

Carex spp.
Bouteloua curtipendula
Oryzopsis micrantha
Bouteloua gracilis
Carex filifolia
Stipa comata

- sw North Dakota (Girard 1985)

[illegible]

PSEUDOTSUGA MENZIESII SERIES (012)

01201

Psme/Acgl

Pseudotsuga menziesii/Acer glabrum p.a.

Moist, northerly aspects, often steep slopes, evident rock cover, mostly on sedimentary substrates, some calcareous, pH 5.9-7.5, 7400-8500 ft. in nw Wyoming. Associated with cold-air drainage.

d <i>Pseudotsuga menziesii</i>	Acer glabrum
a-s <i>Pinus flexilis</i>	Amelanchier alnifolia
s <i>Populus tremuloides</i>	Mahonia repens
a <i>Abies lasiocarpa</i>	
<i>Arnica cordifolia</i>	Calamagrostis rubescens
<i>Osmorhiza chilensis</i>	Carex geyeri
<i>Galium triflorum</i>	Poa nervosa
<i>Smilacina amplexicaulis</i>	
<i>Penstemon</i> spp.	

- Shoshone NF (Steele et al. 1979)
- se Idaho, 4800-8000 ft. (Steele et al. 1981)
- n Utah, 5800-7700 ft. (Mauk and Henderson 1984)
- nw Wyoming
- White River NF, 8400-8700 ft.
- ne Colorado, above 6500 ft. (Bunin 1986)

PHASES: 1. *Paxistima myrsinites* subdominant, associated with *Amelanchier*, *Padus*, and *Mahonia repens* -- Shoshone NF (Steele et al. 1979). Also see Psme/Pamy p.a.

2. *Symphoricarpos oreophilus* codominant in shrub layer, with *Ribes cereum* -- Shoshone NF (Steele et al. 1979), c Idaho (Steele et al. 1981). Also see Psme/Syor1 p.a.

Moir and Ludwig (1979) and Alexander et al. describe an isolated "Pienl/Acgl" community in se Arizona and se New Mexico at 8900-9200 ft., characterized by *Bromus canadensis*, *Viola canadensis*, *Smilacina amplexicaulis*, *Ligusticum porteri*, *Holodiscus dumosus*, *Trisetum spicatum*, *Fragaria virginiana*, *Pseudocymopterus montanus*, *Thalictrum fendleri*, and *Senecio sanguisorbioides*. *Pseudotsuga* is stated to be codominant with Pienl. Steele et al. (1979) cites *Abla* as "accidental" in his Psme/Acgl, with _n_o Pienl. These seem to be completely different communities.

The ne Utah communities (Mauk and Henderson 1984) have more *Symphoricarpos oreophilus*, *Padus virginiana*, and *Fragaria vesca*.

ALSO SEE: - Abco-Psme/Acgl
 - Psme/Cele
 - Psme/Amal

CC

01222

Psme/Amal

Pseudotsuga menziesii/Amelanchier alnifolia p.a.

- = Psme/Osch h.t. (Mauk and Henderson 1984)
- = Potri-Psme/Amal c.t. (Mueggler and Campbell 1986)

Warm, moist sites; lower to middle, steep protected northerly slopes; calcareous or non-calcareous substrates; variety of soil textures and coarse fragment fractions.

d Pseudotsuga menziesii	Amelanchier alnifolia
s Populus tremuloides	Symphoricarpos oreophilus
a Juniperus scopulorum	Padus virginiana
	Mahonia repens
	Paxistima myrsinites
	Rosa woodsii

Osmorhiza chilensis
Thalictrum fendleri
Arnica cordifolia
Silene menziesii

- n Utah, 5400-7850 ft. (Mauk and Henderson 1984, Mueggler and Campbell 1986)
- sw Idaho

ALSO SEE: - Psme/Acgl
- Abco-Psme/Amal

01219 Psme/Arad-Juco

Pseudotsuga menziesii/Arctostaphylos adenotricha-Juniperus communis
p.a.

- = Psme/Aruv h.t. (Pfister et al. 1977, Fitzhugh et al.)
= Pipo-Psme-Juco assn. (Komarkova & Gordon 1982)

Rocky gentle slopes, e or w aspects, 7300-10160 ft.

d <i>Pseudotsuga menziesii</i>	<i>Arctostaphylos adenotricha</i>
d-a <i>Pinus ponderosa</i>	<i>Juniperus communis</i>
<i>Fragaria virginiana</i>	<i>Carex</i> spp.

- A - w Montana, 4700-6500 ft. (Pfister et al. 1977)
- s Idaho, 4600 ft. (Peek et al. 1978)

a-s Pinus contorta	Spiraea betulifolia
a Pinus albicaulis	Shepherdia canadensis
d-a Pinus ponderosa	Mahonia repens
	Symphoricarpos albus
Arnica cordifolia	Carex geyeri
Balsamorhiza sagittata	Roegneria spicata

Purshia tridentata may be conspicuous at midseral dominated by *Pinus ponderosa*.

- B - Arapaho NF
- Roosevelt NF, 7200-8800 ft. (Peet 1975, Komarkova & Gordon 1982)
- Pike NF, 7600-9300 ft. (Radloff 1983, Powell 1985)
- San Isabel NF, 9000-9100 ft. (Powell 1985)

d-a Pinus ponderosa	Ribes cereum
s Populus tremuloides	
s-a Pinus contorta	
a Pinus flexilis	
Drymocallis fissa	Carex rossii

Geranium caespitosum
Clematis columbiana
Solidago spathulata
Pedicularis canadensis

Carex occidentalis
Poa nevadensis
Oryzopsis asperifolia

C - San Juan NF

- Rio Grande NF, 9280-10400 ft. (Shepherd 1975)
- sw New Mexico, 9480-9900 ft. (Fitzhugh et al. 1983)
- ec Colorado, 7300 ft. (Livingston 1949)
- Gunnison NF 9800-10400 ft. (Johnston and Hendzel 1985, Komarkova 1986)

d Pinus strobiformis
s-a Pinus ponderosa
s Populus tremuloides
Solidago spathulata
Senecio fendleri

Rosa woodsii

Carex geyeri
Muhlenbergia montana
Festuca arizonica
Carex praegracilis
Carex heliophila
Festuca thurberi

Populus tremuloides is often long-term seral; *Pinus contorta* may be interposed between *Populus* and *Pseudotsuga* within its area of distribution.

ALSO SEE: - Psme/Juco

- Abco-Psme/Aruv

01220 Psme/Arpa3

Pseudotsuga menziesii/Arctostaphylos patula p.a.

Steep, middle to lower slopes, e-n-w aspects, limestones and sandstones, 7200-8700 ft.

d *Pseudotsuga menziesii*
d *Pinus ponderosa*
a *Juniperus scopulorum*
a *Pinus flexilis*

Arctostaphylos patula
Mahonia repens
Ceanothus martinii
Symphoricarpos oreophilus
Acer glabrum

Picradenia richardsonii

Poa fendleriana
Carex rossii
Leymus salinae

- c Utah, 7200-8700 ft. (Youngblood and Mauk 1985, Graybosch and Buchanan 1983)
- Uncompahgre NF

ALSO SEE: - Abco-Psme/Arpa3

- Pipo/Arpa3

CC	
01202	Psmc/Arco2

Pseudotsuga menziesii/Arnica cordifolia p.a.

Dry slopes, lower to middle slopes, 6500-9500 ft., mainly sandstone-limestone, pH 4.9-8.2.

Pseudotsuga menziesii
 s *Pinus flexilis*
 s *Pinus contorta*
 a *Picea engelmannii*
Arnica cordifolia
Astragalus miser
Senecio streptanthifolius
Antennaria microphylla
Galium septentrionale

Symphoricarpos oreophilus
Ribes cereum
Mahonia repens

Poa nervosa
Festuca idahoensis

- Shoshone NF (Steele et al. 1979, Alexander 1981B)
- w Wyoming
- ec Idaho, 6500-8600 ft. (Steele et al. 1981)
- s Montana (Pfister et al. 1977)
- Bighorn NF, 7350-8560 ft. (Hoffman and Alexander 1976)

PHASE: 1. *Astragalus miser* dominant undergrowth, otherwise depauperate forb layer, 8200-9500 ft. -- Shoshone NF (Steele et al. 1979), c Idaho (Steele et al. 1981).

CC
 01205 Psme/Carul

Pseudotsuga menziesii/*Calamagrostis rubescens* p.a.
 = Psme-Carul h.t. (Daubenmire & Daubenmire 1968)
 = *Pseudotsuga taxifolia*/Carul assn. (Daubenmire 1952)

Variety of substrates, pH 4.7-7.1, moderately dry steep upper slopes and ridges, cool-dry sites, 6000-7800 ft. in nw Wyoming.

d *Pseudotsuga menziesii*
 s *Pinus contorta*
 s *Populus tremuloides*
 a *Pinus flexilis*
 s *Pinus albicaulis*
 s *Pinus ponderosa*
 a *Picea engelmannii*
 a *Juniperus scopulorum*
 a *Abies lasiocarpa*

Mahonia repens
Symphoricarpos oreophilus
Amelanchier alnifolia
Paxistima myrsinites
Padus virginiana
Arctostaphylos adenotricha
Spiraea betulifolia

Arnica cordifolia
Smilacina amplexicaulis
Achillea lanulosa

Calamagrostis rubescens
Carex geyeri
Festuca idahoensis
Roegneria spicata
Poa nervosa
Carex rossii

- n Idaho, above 5000 ft. (Cooper et al. 1983, Hoffman 1960)
- w Wyoming, 6600-8000 ft. (Steele et al. 1979, Alexander 1981B, Youngblood and Mueggler 1981, Cooper 1975)
- Shoshone NF (Terwilliger et al. 1979)
- Montana (Pfister et al. 1977)
- c Idaho (Steele et al. 1981, Schlatterer 1972)
- ne Oregon, 5300-6700 ft. (Cole 1982)
- n Utah, 6440 ft. (Mauk and Henderson 1984)
- c Oregon (Buckhouse and Mattison 1980)

Reported from the Shoshone NF by Terwilliger et al., but not by Steele et al. (1979). Also see Psme/Syal, which is closely related. Pfister et al. (1977) also list a related p.a., Psme/Syal phase Carul.

Steele et al. (1979, 1981) describe four phases:

PHASES: 0. *Calamagrostis rubescens*, common typical phase, 6000-8100 ft., with sparse shrubs and forbs, in w Wyoming and n Idaho (Cooper 1975-1983).

1. *Paxistima myrsinites* conspicuous at 6000-7700 ft.; with *Mahonia repens*, *Padus virginiana*, and *Symphoricarpos oreophilus*, in W Wyoming.

2. *Festuca idahoensis* interspersed with *Calamagrostis rubescens* on drier borders with grassland communities, 6800-7600 ft. in c Idaho.

3. *Pinus ponderosa* codominant at warmer lower elevations, 4100-6500 ft. in c Idaho.

ALSO SEE: - Abia-Pienl/Carul

01206	Psme/Cage1
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Pseudotsuga menziesii/Carex geyeri p.a.

Lower elevations, n-nw aspects in n Colorado, s-se aspects in n Wyoming and Montana, conglomerate-sandstone-shale parent material, pH 5.2-7.2, 6100-7600 ft. in s Montana, 7600-9200 ft. in n Colorado.

d Pseudotsuga menziesii	Symphoricarpos oreophilus
s Pinus contorta	Juniperus communis
	Mahonia repens
Achillea lanulosa	Carex geyeri
Arnica cordifolia	Poa spp.
Fragaria sp.	

A - n Idaho (Cooper et al. 1983)

- nw Wyoming (Cooper 1975)

- Montana, 6100-7600 ft. (Pfister et al. 1977, Alexander 1981B)

- c Idaho, 6500-8000 ft. (Steele et al. 1981)

- Shoshone NF (Terwilliger et al. 1979)

s *Pinus ponderosa*

Amelanchier alnifolia

s *Populus tremuloides*

Artemisia tridentata

a *Pinus flexilis*

Spiraea betulifolia

a *Abies lasiocarpa*

Symphoricarpos albus

a Pinus albicaulis

Balsamorhiza sagittata

Poa nervosa

Osmorhiza chilensis

B - Arapaho NF, 7600-9200 ft. (Giese 1975, Hess 1981)

- Gunnison NF, 9760 ft. (Komarkova 1986)

a <i>Juniperus scopulorum</i>	<i>Paxistima myrsinites</i>
	<i>Rosa woodsii</i>
	<i>Acer glabrum</i>
<i>Clematis columbiana</i>	<i>Poa nemoralis</i>
<i>Astragalus</i> spp.	
<i>Galium septentrionale</i>	
<i>Anaphalis margaritacea</i>	
<i>Erigeron speciosus</i>	

ALSO SEE: - Psme/Syorl

- Psme/Mare phase Cage1

[illegible]

01204

Psme/Caro3

Pseudotsuga menziesii/Carex rossii p.a.

Steep (45-65%) n-nw slopes, loams, pH 6.6-6.8, 5700-9640 ft.

d Pseudotsuga menziesii	Juniperus communis
s Juniperus scopulorum	Physocarpus monogynus
d? Pinus ponderosa	Artemisia tridentata
	Ribes cereum
Achillea lanulosa	Carex rossii
Campanula rotundifolia	Leucopoa kingii
Artemisia ludoviciana	Elytrigia dasystachya
Cystopteris fragilis	Koeleria macrantha
Heuchera bracteata	Poa agassizensis
Pulsatilla patens	
Micranthes rhomboidea	
Drymocallis fissa	
Senecio fendleri	

- Roosevelt NF (Peet 1975, Hess 1981, Wasser and Hess 1982, Hess and Alexander 1986)

Very likely this belongs in a codominant Pipo-Psme series. In that connection, see notes to Pipo/Mumol.

01223	Psmc/Cele
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Pseudotsuga menziesii/Cercocarpus ledifolius p.a.

= Abco/Cele h.t. (Youngblood and Mauk 1985)

Dry, very exposed slopes on northerly aspects at lower elevations, southerly at upper elevations, desiccation from winds and sun, little snow accumulation; shallow, rocky soils from limestone and other calcareous substrates.

d <i>Pseudotsuga menziesii</i>	<i>Cercocarpus ledifolius</i>
a <i>Juniperus scopulorum</i>	<i>Symphoricarpos oreophilus</i>
a <i>Pinus flexilis</i>	<i>Paxistima myrsinites</i>
a-d <i>Abies concolor</i>	<i>Mahonia repens</i>
a <i>Pinus ponderosa</i>	<i>Amelanchier alnifolia</i>
a <i>Picea pungens</i>	<i>Artemisia tridentata</i>
a <i>Populus tremuloides</i>	<i>Padus virginiana</i>
a <i>Pinus edulis</i>	
<i>Achillea lanulosa</i>	<i>Leucopoa kingii</i>
<i>Pseudostellaria jamesiana</i>	<i>Carex rossii</i>
<i>Balsamorhiza sagittata</i>	<i>Poa fendleriana</i>

- nw Utah, 6300-8000 ft. (Mauk and Henderson 1985)

- sw Idaho

- s Utah, 7000-9400 ft. (Youngblood and Mauk 1985)

It is unlikely that *Abies concolor* can maintain more than sparse codominance on these dry sites, even though it is more shade-tolerant.

ALSO SEE: - Psme/Acgl phase Pamy

- Pif1/Cele

ALSO SEE: - Pipo-Psme/Mumol
- Piar/Fear1
- Pipo/Fear1
- Abco-Pif1/Fear1

01208	Psme/Feid
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Pseudotsuga menziesii/*Festuca idahoensis* p.a.

Sandy loam to silty soils on n aspects at lower timberline, 3000-8000 ft., substrate a variety of materials, pH 5.4-6.7.

d Pseudotsuga menziesii
d Pinus ponderosa
a Pinus contorta
Pinus flexilis
Juniperus scopulorum

Festuca idahoensis
Leucopoa kingii

- A - n Idaho (Cooper et al. 1983)
- c Idaho, 3000-8000 ft. (Steele et al. 1981)
- wc Montana (Pfister et al. 1977)

Associated with *Artemisia tridentata*, *Juniperus horizontalis*, *Juniperus communis*, *Roegneria spicata*, *Arnica cordifolia*, *Balsamorhiza sagittata*, *Antennaria microphylla*, *Achillea lanulosa*, *Fragaria vesca*, *Spiraea betulifolia*, and *Pteridium aquilinum*.

B - Shoshone NF, ca. 6000 ft. (Steele et al. 1979)

Associated with *Ribes cereum*, *Symphoricarpos oreophilus*, and *Leymus cinereus*. Only the typical *Festuca idahoensis* phase of Steele et al. (1979) is discussed here. *Pinus ponderosa* and *Pseudotsuga menziesii* seem to be codominant in many of the areas described.

C - Gunnison NF, 9920 ft. (Komarkova 1986)

Open stands, associated with *Ribes cereum*, *Koeleria macrantha*, and *Carex geyeri*.

01209	Psme / Jaam
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Pseudotsuga menziesii/Jamesia americana p.a.

Steep to very steep (55-75%) n-nw slopes, shallow sandy loam soils with exposed rock on surface, pH 6.2-6.8, 7200-9200 ft.

d <i>Pseudotsuga menziesii</i>	<i>Jamesia americana</i>
s <i>Juniperus scopulorum</i>	<i>Physocarpus monogynus</i>
s <i>Pinus ponderosa</i>	<i>Juniperus communis</i>
s <i>Pinus contorta</i>	<i>Arctostaphylos adenotricha</i>
	<i>Clematis columbiana</i>

Achillea lanulosa	Leucopoa kingii
Fragaria virginiana	Carex rossii
Drymocallis fissa	
Ciliaria austromontana	
Heuchera bracteata	
Anaphalis margaritacea	

Leucopoa kingii
Carex rossii

- ne Colorado, above 6500 ft. (Bunin 1986)
- Roosevelt NF (Hess 1981, Wasser and Hess 1982, Komarkova and Gordon 1982, Wirsing 1970, Hess and Alexander 1986)
- Pike NF, 8300-9200 ft. (Terwilliger et al. 1979, Radloff 1983)
- Gunnison NF. 9800 ft. (Komarkova 1986)

ALSO SEE: - Abco-Psme/Jaam (as "Abco/scree h.t."; Fitzhugh et al.), from sw New Mexico at 9200-9400 ft., with *Pinus strobiformis*, *Bromus canadensis*, *Koeleria macrantha*, and *Allium cernuum*.

- Pipu-Psme/Jaam (as "Pipu/Popr h.t." in part; De Velice et al. 1985), from n New Mexico at 7700 ft., with *Acer glabrum*, *Paxistima myrsinites*, *Erigeron eximius*, and *Geranium richardsonii*.

CC

01210	Psme/Juco
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Pseudotsuga menziesii/Juniperus communis p.a.

Exposed rocky slopes and rocky ridgetops, variety of substrates, pH 5.6-8.1, 6500-9300 ft. in n Wyoming, 7400-8800 ft. in n Colorado.

d *Pseudotsuga menziesii*

a *Pinus contorta*

a *Pinus flexilis*

a *Populus tremuloides*

Arnica cordifolia

Astragalus miser

Senecio streptanthifolius

Achillea lanulosa

Galium septentrionale

Juniperus communis

Ribes spp.

Symphoricarpos oreophilus

Juniperus horizontalis

Mahonia repens

Poa nemoralis

- Shoshone NF, 6500-9300 ft. (Steele et al. 1979)
- nw Wyoming (Cooper 1975)
- ec Idaho, 7500-8400 ft. (Steele et al. 1981)
- Montana (Pfister et al. 1977)
- Bighorn NF, 7760-8500 ft. (Hoffman & Alexander 1976)

ALSO SEE: - Psme/Arad-Juco

- Pipo/Juco

- Pien1-Psme/Juco

- Psme/Mare phase Juco

01203	Psmc/Mare
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Pseudotsuga menziesii/Mahonia repens p.a.

- = Psme/Berberis repens h.t. phase Pipo (Hoffman & Alexander 1976, Henderson et al. 1977, Steele et al. 1979-1981, Cole 1982, Youngblood and Mauk 1985)
- = Psme/Berberis repens p.a. (Terwilliger et al. 1979)
- = Potri-Psme/Juco c.t. (Mueggler and Campbell 1986)

Cool, dry, lower elevations, often adjoining sagebrush stands, loam to silty loam soils, mainly derived from shales, sandstones, and glacial moraines, pH 5.3-7.7, 5700-9600 ft., northerly aspects at lower elevations, all aspects higher.

d *Pseudotsuga menziesii*

s *Populus tremuloides*

s *Pinus flexilis*

Mahonia repens

Symphoricarpos oreophilus

Ribes sp.

a Juniperus scopulorum	Padus virginiana
a-s Pinus contorta	Amelanchier alnifolia
a-s Populus tremuloides	Symphoricarpos oreophilus
Arnica cordifolia	Calamagrostis rubescens
Balsamorhiza sagittata	Carex geyeri
Disporum trachycarpum	Roegneria spicata
Smilacina amplexicaulis	Festuca idahoensis
Thalictrum occidentale	Elymus glaucus
Moehringia macrophylla	

- c Oregon, 2500-5500 ft. (Hall 1973)
- w Montana, 5100-6700 ft. (Pfister et al. 1977, Crane et al. 1983, Crane and Habeck 1982, Noste 1982, Arno et al. 1985)
- Idaho, 2000-7100 ft. (Steele et al. 1981, Cooper et al. 1983, Cholewa and Johnson 1983, Zimmerman and Neuenschwander 1983, Armour et al. 1984, Rickard 1960)
- nw Wyoming, 6310-7450 ft. (Cooper 1975)
- Shoshone NF, 5400-7500 ft. (Steele et al. 1979)
- nw Utah, 5000-7000 ft. (Lawton 1979, Mauk and Henderson 1984)
- ne Oregon, below 6000 ft. (Cole 1982)
- c Utah, 8000-9100 ft. (Youngblood and Mauk 1985)

Steele et al. (1979, 1981) states that this is the typical phase. Steele et al. describe a Pamy phase in addition; Cooper et al. (1983) describe Cagel and Carul phases. The p.a. as found in this Region corresponds to "dry phase" of Arno et al. (1985). The nw Wyoming community (Cooper 1975) also has *Mahonia repens*, *Paxistima myrsinites*, and *Fragaria vesca*. The nw Utah community (Mauk and Henderson 1984) also has *Mahonia repens*, *Paxistima myrsinites*, and *Mitella stauropetala*.

ALSO SEE: - Abco-Psme/Phma
- Ab1a-Psme/Phma

01213 Psme/Phmo

Pseudotsuga menziesii/*Physocarpus monogynus* p.a.

Cold-air drainage, low insolation, lower montane slopes, moderate to steep n-nw aspects, shallow rocky sandy loam to silty loam soils, pH almost neutral, 6100-6600 ft. in n Wyoming, 5900-7800 ft. in n Colorado.

d Pseudotsuga menziesii	Physocarpus monogynus
d? Pinus ponderosa	Rosa spp.
a Juniperus scopulorum	Symphoricarpos oreophilus
Arnica cordifolia	

- A - nw Wyoming, ca. 6100 ft. (Steele et al. 1983)
- Bighorn NF, 6160-6600 ft. (Hoffman and Alexander 1976)

This is characterized by occasional *Pinus flexilis*, seral *P. contorta* and *Juniperus scopulorum*, and associated with *Mahonia repens*, *Rosa acicularis*, *Spiraea betulifolia*, *Anemone multifida*, *Balsamorhiza sagittata*, *Clematis tenuiloba*, and *Lomatium dissectum*. Terwilliger et al. (1979) report this as phase *Leucopoa kingii*, but Hoffman and Alexander (1976) do not show this grass at all.

- B - Medicine Bow NF (Terwilliger et al. 1979)
 - Roosevelt NF, 5900-8040 ft. (Peet 1975, Hess 1981, Wasser and Hess 1982, Hess and Alexander 1986)
 - Arapaho NF
 - ne Colorado, above 6000 ft. (Bunin 1986)
 - Pike NF
 - Routt NF
 - Rio Grande NF (Moir and Ludwig 1979)
 - nc New Mexico, 8900 ft.

This sometimes has *Populus tremuloides* as a seral tree. Associates include *Ribes cereum*, *Juniperus communis*, *Jamesia americana*, *Rosa woodsii*, *Cystopteris fragilis*, *Dryocallis fissa*, *Carex rossii*, *Pulsatilla patens*, *Shepherdia canadensis*, *Smilacina amplexicaulis*, *Leucopoa kingii*, *Sedum lanceolatum*, and *Thalictrum fendleri*. This p.a. was not included in the Medicine Bow NF by Wirsing and Alexander (1975), nor was it included in the Routt NF by Hoffman and Alexander (1980). The nc New Mexico community (Moir and Ludwig 1979) includes occasionally *Abies concolor* or *Picea pungens*.

CC
 01214 Psme/Quga

Pseudotsuga menziesii/*Quercus gambelii* p.a.

= Psme/Amut-Quga-Syor1/Cagel-Pofe h.t. (Baker 1982)

Moderate to steep, upper to lower slopes or ridges, 31-81%, variety of aspects, 6200-9700 ft., Borollic soils.

d *Pseudotsuga menziesii*
 s-a *Pinus ponderosa*
 a *Juniperus scopulorum*

Quercus gambelii
Amelanchier alnifolia
Mahonia repens
Symphoricarpos oreophilus
Paxistima myrsinites
Padus virginiana

Poa fendleriana
Koeleria macrantha

- A - White River NF, 8150-8350 ft. (Boyce 1977)
 - nw Colorado, 6230-8530 ft. (Baker 1982)

This community also includes *Carex geyeri*, *Bromus porteri*, *Artemisia ludoviciana*, *Solidago sparsiflora*, *Antennaria rosea*, *Senecio multilobatus*, *Carex ptyophila*, and *Erigeron speciosus*.

- B - San Juan NF, 7100-9300 ft. (De Velice et al. 1985)
 - San Isabel NF, 8000 ft. (De Velice et al. 1985)
 - Pike NF (Terwilliger et al. 1979)
 - Rio Grande NF
 - n New Mexico, 7100-9000 ft. (De Velice et al. 1985)
 - se New Mexico, 7200-8500 ft. (Alexander et al. 1983)
 - wc New Mexico, 6500-9650 ft. (Fitzhugh et al. 1983)
 - n Arizona, 6900-9000 ft. (Alexander et al. 1984)
 - se Utah, 7500-9100 ft. (Youngblood and Mauk 1985)
 - se Arizona-sw New Mexico, 6300-7600 ft. (De Velice and Ludwig 1983)

d *Pseudotsuga menziesii*
 s *Pinus ponderosa*
 a *Pinus strobiformis*

Quercus gambelii
Cercocarpus montanus
Q. undulata

Galium septentrionale
Geranium caespitosum
Lathyrus arizonicus
Lithospermum multiflorum
Thalictrum fendleri

Bromus canadensis
Poa fendleriana
Koeleria macrantha

This seems to be completely different from the above.

PHASE: 1. Festuca arizonica present, sometimes conspicuous in the grass layer, at slightly higher elevations, with more Cercocarpus montanus and less Amelanchier or Mahonia, but more Koeleria macrantha, Muhlenbergia montana, Blepharoneuron tricholepis, and Elymus elymoides -- San Juan, Rio Grande, and San Isabel NFs (De Velice et al. 1985); wc New Mexico, 8700-9400 ft. (Fitzhugh et al. 1983).

CC

01211 Psme/Pamy

Pseudotsuga menziesii/Paxistima myrsinites p.a.

- = Psme-Pamy/Amal assn. (Bunin 1975)
- = Psme-Abla-Pienl/Pamy/Cagel assn., in part (Boyce 1977)
- = Psme/Vagl h.t. in part (Cooper 1975)

Steep rocky slopes, shallow (avg. 18 cm) coarse sandy loam to silt loam soils, pH 5.9-7.4, steep to very steep (27-110%) ne-nw aspects, moderately deep soils, moderately to slowly permeable, 5000-8900 ft.

d Pseudotsuga menziesii
a Abies lasiocarpa
s Populus tremuloides
d-a Picea engelmannii
a Juniperus scopulorum
a Abies concolor
a Pinus flexilis

Paxistima myrsinites
Acer glabrum
Amelanchier alnifolia
A. utahensis
Symphoricarpos oreophilus
Vaccinium myrtillus
s Quercus gambelii
Rosa woodsii
Mahonia porteri

Arnica cordifolia
Aster engelmannii
Chamerion angustifolium
Lathyrus leucanthus
Osmorhiza sp.
Aquilegia coerulea
Fragaria sp.
Solidago multiradiata

Carex geyeri
Calamagrostis rubescens
Bromus porteri

- nw Wyoming, 6640-8250 ft. (Cooper 1975)
- Routt NF, 7100-8400 ft. (Bunin 1975, Hoffman and Alexander 1980)
- White River NF, 7800-8860 ft. (Boyce 1977, Hess and Wasser 1982, Wasser and Hess 1982, Hoffman and Alexander 1983)
- nw Utah, 5000-8750 ft. (Ream 1964)
- Gunnison NF, 9920 ft. (Komarkova 1986)

It is apparent that Psme/Pamy is also closely related to Abla-Pienl/Pamy, for they were included in the same association by Boyce (1977).

ALSO SEE: - Psme/Syorl
- Abco-Psme/Amal

CC

Gentle slopes and ridgetops.

- Gunnison NF, 9200-9800 ft. (Komarkova 1986)

01215	Psme/Spbe
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Warm, dry upper slopes and southerly-facing ridges, 6600-8200 ft. in nw Wyoming, limestone-sandstone-quartzite-andesite, pH 5.4-6.7.

- c-ne Idaho, 3300-8100 ft. (Steele et al. 1981, Cooper et al. 1983)
- nw Wyoming (Youngblood and Mueggler 1981, Cooper 1975)
- Shoshone NF (Steele et al. 1979, Alexander 1981B)
- Montana (Pfister et al. 1977)

PHASES: 0. *Spiraea betulifolia* predominant, 6600-8200 ft., with *Pinus flexilis* sometimes present as a seral tree.

1. *Calamagrostis rubescens* mixed with *Carex geyeri*, with seral *Populus tremuloides*, 6000-7900 ft., transitional to Psme/Carul or Aba/Carul.

3. *Pinus ponderosa* at warmer lower elevations, with common *Amelanchier alnifolia* and *Salix* spp., 3300-6000 ft. in c Idaho.

The n Idaho community (Cooper et al. 1983) also has *Rosa gymnocarpa*, *Symphoricarpos albus*, *Roegneria spicata*, *Festuca idahoensis*, *Balsamorhiza sagittata*, nand *Pteridium aquilinum*.

01216	Psmc/Sya1
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Pseudotsuga menziesii/Symphoricarpos albus p.a.

= Psme-Syal h.t. (Daubenmire & Daubenmire 1968)

Lower slopes and benches, gravelly surface, moist sandy loam to silts, e-s aspects, pH 5.5-7.5, 5700-7400 ft. in n Wyoming.

- A - c Idaho, 4500-8000 ft. (Steele et al. 1981, Schlatterer 1972)
 - sw Montana, ca. 6500 ft. (Pfister et al. 1977)
 - Shoshone NF, 6600-9510 ft. (Reed 1976, Steele et al. 1983, Wasser and Hess 1982)
 - nw Wyoming (Cooper 1975)
 - ec Idaho
 - n Utah, 7000-9600 ft. (Alexander 1981B, Mauk and Henderson 1984)
 - Bighorn NF, 7240 ft. (Hoffman & Alexander 1976)
 - c-s Utah, 7800-9700 ft. (Youngblood and Mauk 1985)

Steep northerly slopes. In addition, these communities have:

a-d <i>Pinus flexilis</i>	<i>Artemisia tridentata</i>
s-a <i>Pinus contorta</i>	<i>Amelanchier alnifolia</i>
d <i>Pinus ponderosa</i>	<i>Ribes cereum</i>
s <i>Populus tremuloides</i>	
<i>Achillea lanulosa</i>	<i>Roegneria spicata</i>
<i>Antennaria microphylla</i>	<i>Carex rossii</i>
<i>Astragalus miser</i>	<i>Festuca idahoensis</i>
<i>Balsamorhiza sagittata</i>	<i>Poa nervosa</i>
<i>Senecio streptanthifolius</i>	<i>Leucopoa kingii</i>

ALSO SEE: - Psme/Acgl phase Syor1
 - Psme/Cage1

- B - Arapaho NF (Terwilliger et al. 1979)
 - Routt NF
 - White River NF, 6890-8200 ft. (Hess and Wasser 1982, Wasser and Hess 1982)
 - nw Colorado, 6200-9800 ft. (Tiedeman 1978, Baker 1982, Ferchau 1973)
 - sw New Mexico, 9680-9900 ft. (Fitzhugh et al. 1983)
 - c Idaho, below 8000 ft. (Schlatterer 1972)
 - Gunnison NF, 7960-9300 ft. (Komarkova 1986)
 - n Utah, 6600-9200 ft. (Mauk and Henderson 1984)

a <i>Pinus edulis</i>	<i>Holodiscus dumosus</i>
a <i>Pinus strobiformis</i>	<i>Amelanchier utahensis</i>
	<i>Paxistima myrsinites</i>
	<i>Quercus gambelii</i>
	<i>Robinia neomexicana</i>
<i>Clematis columbiana</i>	<i>Carex geyeri</i>
<i>Smilacina stellata</i>	
<i>Vicia americana</i>	
<i>Osmorhiza</i> sp.	
<i>Galium septentrionale</i>	
<i>Geranium richardsonii</i>	
<i>Oreochrysum parryi</i>	

Shallow, gravelly rocky loam soils, usually steep hillsides canyons and scree slopes, ne-nw-facing 15-90% slopes, precipitation 15-22 in/yr. Eutroboralfs and Argiborolls from shales or sandstones.

PHASES: 1. *Mahonia repens* conspicuous on cooler or moister sites --
 c-s Utah, 7800-9700 ft. (Youngblood 1984)

3. *Leucopoa kingii* conspicuous on warmest and driest sites, with *Artemisia tridentata* and *Ribes montigenum* occasional, associated with *Paxistima myrsinites*, *Pseudostellaria jamesiana*, and *Senecio streptanthifolius* -- n Utah, 6000-9200 ft. (Mauk and Henderson 1984).

ALSO SEE: - Psme/Pamy
- Psme/Cage1
- Psme/Mare

Pseudotsuga menziesii/Vaccinium globulare p.a.

d Pseudotsuga menziesii
s Pinus contorta
s Pinus ponderosa
a Abies lasiocarpa

Vaccinium globulare
Amelanchier alnifolia
Juniperus communis
Paxistima myrsinites
Shepherdia canadensis
V. scoparium
Spiraea betulifolia

Arnica cordifolia
A. latifolia
Thalictrum occidentale
Orthilia secunda
Osmorhiza chilensis
Smilacina alexipicaulis
Linnaea borealis

Calamagrostis rubescens
Carex geveari

- The nw Wyoming community (Cooper 1975) also has *Sorbus scopulina*, *Lonicera utahensis*, *Chimaphila umbellata*, and *Disporum trachycarpum*.

149

BETULA PAPYRIFERA SERIES (108)

- sw North Dakota, 2240 ft. (Hansen et al. 1984, Girard 1985, Nelson 1961)
- se Montana, 3400-3700 ft. (MacCracken and Uresk 1984, MacCracken et al. 1983)

PHASE: 1. *Calamovilfa longifolia* and *Elymus canadensis* conspicuous at lower elevations; *Rosa woodsii* less abundant; *Elymus trachycaulus*, *Juniperus communis*, and *Ribes setosum* more abundant; silt loams and loams -- sw North Dakota, 1970 ft. (Hansen et al. 1984). *Poa pratensis* and *Trifolium pratense* often invade.

ALSO SEE: - Osvi/Crsu
- Frpe/Pavi

10702	Frpe/Pavi
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Fraxinus pennsylvanica/Padus virginiana p.a.
= Frpe-Ulam/Prvi h.t. (Girard 1985)

Ravine, narrow stringers in draws, valley bottoms, or moderately-steep n-facing slopes, middle to lower slopes, clay-silty clay-clay loam soils, pH 7.2-8.1

Fraxinus pennsylvanica	Padus virginiana
Juniperus scopulorum	Symphoricarpos occidentalis
Acer negundo	Rosa woodsii
Ulmus americana	Ribes odoratum
	Clematis ligusticifolia
	Prunus americana
	Amelanchier alnifolia
Smilicina stellata	Elymus virginicus

- sw North Dakota, 2310-2330 ft. (Hansen et al. 1984, Girard 1985, Nelson 1961, Butler et al. 1986)
- Thunder Basin NG (Steward 1984)

PHASE: 1. *Carex sprengelii* very conspicuous on acidic or alkaline soils, at higher elevations; *Ulmus americana* often codominant, *Symphoricarpos occidentalis* and *Juniperus scopulorum* much reduced in cover, *Rosa woodsii* absent; *Ribes setosum*, *Sanicula marilandica*, and *Smilacina stellata* present -- sw North Dakota, 2390-2400 ft., pH 6.0-8.1 (Hansen et al. 1984, Girard 1985, Hansen and Hoffman 1986, Nelson 1961)

ALSO SEE: - Frpe/Syoc

[illegible]

OSTRYA VIRGINIANA SERIES (102)

10202

Osvi/Crsu

Ostrya virginiana/Crataegus succulenta p.a.

Woody draws, small springs which flow from the clay layer in canyons, springbranch canyons, springs in deep canyons.

Thalictrum fendleri
Geranium richardsonii
Heracleum sphondylium
Mertensia ciliata
Osmorhiza depauperata
Viola canadensis
Erigeron eximius
Smilacina stellata
Galium triflorum
Smilacina amplexicaulis

- San Juan NF, 8200-9060 ft. (De Velice et al. 1985)

10304 Poan3/Phmo-Pavi

Populus angustifolia/Physocarpus monogynus-Padus virginiana p.a.

d *Populus angustifolia*
Populus tremuloides
a *Acer negundo*
a *Juniperus scopulorum*

Viola sp.

- Bighorn NF, 4500-6500 ft. (Olson and Gerhart 1982)

10302	Poan3/Saex-Befo
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Populus angustifolia/Salix exigua-Betula fontinalis p.a.

= Poan3/SALI h.t. (Terwilliger 1979, Terwilliger et al. 1979)

= Poan3/Saex h.t. (Hess 1981, Hess and Alexander 1986)

Upper foothills and lower montane, narrow flat benches adjacent to small streams and broad floodplains and sandbars of larger streams, alluvial-fluvial origin, pH 6.2-7.4, 4500-7800 ft., precip. 10-19 in/yr.

Salix exigua
Alnus incana spp. tenuifolia
Betula fontinalis
Rosa woodsii
Swida sericea
Salix caudata
Salix bebbiana
Salix lutea
Distegia involucrata
Ribes spp.
S. monticola
Acer glabrum
Salix lasiandra

Smilacina stellata
Vicia americana

- This p.a. was reported as two, Poan3/Saex-Sair and Poan3/SALI, by Terwilliger et al. (1979), but they have no apparent distinguishing factors apparent from their descriptions. This p.a. was reported by Hess (1981) as Poan3/Saex, but other species apparently share subdominance with *Salix exigua*. In other NF's, other species of *Salix* may be subdominant, as future studies may show. Except for the *Populus angustifolia* overstory, Poan3/Saex-Befo is very similar in composition to Alte-Befo/SALI. The Bighorn NF community also had *Physocarpus monogynus*, *Clematis ligusticifolia*, *Stipa nelsonii*, and *Rhus aromatica* spp. *trilobata*. The Idaho community had more *Swida sericea*.

[illegible]

POPULUS SARGENTII-P. WISLIZENII- P. FREMONTII SERIES (104)

Posa/Syoc-Leci

= Posa/Elci h.t. (Terwilliger 1979, Terwilliger et al. 1979)

= *Populus deltoides*/Frpe c.t. (Girard 1985)

River floodplains and riparian areas along the major drainages, fresh alluvium, found mainly at lower elevations, woody draws, pH 8.0-8.3

d <i>Populus sargentii</i>	<i>Symphoricarpos occidentalis</i>
a <i>Fraxinus pennsylvanica</i>	<i>Rosa woodsii</i>
a <i>Acer negundo</i>	<i>Artemisia cana</i>
<i>Ulmus americana</i>	<i>Padus virginiana</i>
<i>Celtis occidentalis</i>	<i>Salix rigida</i>
a <i>Juniperus scopulorum</i>	<i>Rhus aromatica</i> spp. <i>trilobata</i>
	<i>Salix amygdaloides</i>
	<i>Shepherdia argentea</i>
	<i>Toxicodendron rydbergii</i>
<i>Smilacina stellata</i>	<i>Leymus cinereus</i>
<i>Lysimachia ciliata</i>	<i>Spartina pectinata</i>
<i>Thalictrum venulosum</i>	<i>Phalaris arundinacea</i>
	<i>Elymus candensis</i>
	<i>Elymus trachycaulus</i>
	<i>Carex</i> spp.
	<i>Poa</i> spp.

- Thunder Basin NG (Terwilliger 1979)
- c Montana, 4000-4500 ft. (Jorgensen 1979)
- sc South Dakota, 3000-3500 ft. (Tolstead 1941)
- sw North Dakota (Girard 1985, Nelson 1961)

Jorgensen (1979) states that the distribution of the major species to the small, isolated occurrences of this p.a. is largely due to chance, and so varies widely. Inexplicably, he does not mention *Elymus* spp. Girard (1985) states that *Populus sargentii* in these sites is seral to Frpe/Syoc. *Juniperus scopulorum* is more prominent in earlier seral stages.

PHASE: 1. *Swida sericea* conspicuous, with more *Salix rigida*, *Salix* interior, and *Rosa woodsii*; *Fraxinus pennsylvanica* more often co-dominant -- w North Dakota (Nelson 1961).

[illegible]

10404

Posa/Riam

Populus sargentii/Ribes americanum p.a.

Along river banks.

Populus sargentii	Salix interior
Salix amygdaloides	Ribes americanum
	Amorpha fruticosa
	Salix rigida

- Nebraska NF (Terwilliger et al. 1979)

[illegible]

10405

Posa/Syoc-Saex

Populus sargentii/*Symphoricarpos occidentalis*-*Salix exigua* p.a.

Plains floodplains, with sand-sagebrush sandhills above and south.

Symphoricarpos occidentalis
Salix exigua
Toxicodendron rydbergii

10403 Posa/SALI

Posa/SALI

Salix exigua
Salix irrorata
Padus virginiana
Spartina pectinata

- ne Colorado, below 6000 ft. (Bunin 1986)

10402 Posa-Poan3/SALI

Posa-Poan3/SALI

= *Populus deltoides* var. *occidentalis*/SALI p.a. (Larson 1980)

Salix depressa
S. fendleriana
S. balsamifera
S. fluviatilis
S. lutea

Poa palustris
Agrostis spp.

[illegible]

Potri/Amal-Pavi

= Potrl/Prvi c.t. (Youngblood & Mueggler 1981)

Montane benches and slopes, shallow to steep slopes and draws, 7400-9400 ft., 10-70% (average 30-35%), variety of aspects but mostly w-nw and e-ne, moderately drained coarse to very coarse deep soils.

d <i>Populus tremuloides</i>	<i>Amelanchier alnifolia</i>
a <i>Pseudotsuga menziesii</i>	<i>Padus virginiana</i>
	<i>Symphoricarpos oreophilus</i>
	<i>Rosa woodsii</i>
<i>Geranium</i> spp.	<i>Bromus porteri</i>
<i>Thalictrum fendleri</i>	<i>Poa</i> spp.
<i>Delphinium barbeyi</i>	<i>Elymus glaucus</i>
<i>Ligusticum porteri</i>	<i>Bromus canadensis</i>
<i>Fragaria</i> spp.	<i>Carex geeyeri</i>
<i>Lathyrus leucanthus</i>	<i>Elymus trachycaulus</i>
<i>Vicia americana</i>	
<i>Osmorhiza</i> spp.	

- Medicine Bow NF, 7400-8550 ft. (Severson 1963, Current 1984)
- nw Colorado, 7400-8600 ft. (Baker 1982)
- Routt NF, 7600-8800 ft. (Bunin 1975, Crouch 1981, Johnston and Hendzel 1981)
- White River NF, 8600-9200 ft. (Hoffman 1982)
- Grand Mesa NF, 8200 ft. (Johnston and Hendzel 1985)
- s Saskatchewan (Jones and Peterson 1970)
- se Idaho, 5200-7300 ft. (Mueggler and Campbell 1982)
- nw Wyoming, 5750-7550 ft. (Youngblood and Mueggler 1981)
- nc Utah, 8000-8400 ft. (Kleinman 1973, Crowther and Harper 1965)
- Gunnison NF, 7940-9330 ft. (Komarkova 1986)

The conspicuous tall-shrub layer makes this a unique community in appearance. The Idaho community also includes *Calamagrostis rubescens* and *Symphoricarpos albus*. Hoffman (1982) included this in Potrl/Syorl.

PHASES: 1. *Acer glabrum* conspicuous in addition to the other shrubs; *Shepherdia canadensis* and *Osmorhiza* sp. also present -- White River NF. This is a stable community that in places may be very slowly seral to Psme/Acgl.

2. *Quercus gambelii* conspicuous, lower elevations, 7600-7900 ft., with *Mahonia repens*, *Vicia americana*, *Pseudostellaria jamesiana*, *Achillea lanulosa*, *Aster engelmannii*, and *Geranium caespitosum* -- Routt NF (Bunin 1975); nc Utah (Kleinman 1973); Gunnison NF, 9325 ft. (Komarkova 1986). At lower ranges of elevations, this may adjoin stands where *Populus tremuloides* is absent, but are otherwise similar.

3. *Aster engelmannii* and *Thalictrum fendleri* subdominant at higher elevations, 8000-8800 ft., and very coarse soils, with *Agastache urticifolia*, *Vicia americana*, *Heliomeris multiflora*, and *Helianthella quinquenervis* -- Routt NF (Bunin 1975).

4. *Populus balsamifera* subdominant, with *Amelanchier alnifolia*, *Symphoricarpos occidentalis*, and *S. albus*; *Padus virginiana* missing. -- s. Saskatchewan (Jones and Peterson 1970)

ALSO SEE: - Potrl/Pavi

- Poba/Swse

- Potrl/Acer grandidentatum h.t., with *Padus virginiana*, *Physocarpus malvaceus*, *Amelanchier alnifolia*, and *Symphoricarpos oreophilus*, from Utah, 5800-8000 ft. (Mueggler and Campbell 1986). This is closely similar to Potrl/Amal-Pavi phase Acgl described above, with replacement of *Acer glabrum* by *Acer grandidentatum*. *A. grandidentatum* is rare in Region 2, and one species may gradually replace the other across a broad north-south band along the Colorado-Utah border.

[illegible]

Potr1/Arad

Populus tremuloides/Arctostaphylos adenotricha p.a.

Slow-moving talus and scree slopes, Cryoboralfs, pH 6.2-6.5.

d <i>Populus tremuloides</i>	<i>Arctostaphylos adenotricha</i>
	<i>Carex geophila</i>
	<i>Bromus porteri</i>

- Gunnison NF, 10500 ft. (Komarkova 1986)

[illegible]

Potr1/Artr

Populus tremuloides/Artemisia tridentata p.a.

= Potrl/Artr-Feid h.t. (Mueggler & Campbell 1982)

Lower timberline, s-w aspects, deep to moderately deep soils, moderately steep, 7820-7860 ft. in w Wyoming, warm dry.

d <i>Populus tremuloides</i>	<i>Artemisia tridentata</i>
a <i>Pinus contorta</i>	<i>Rosa woodsii</i>
a <i>Pinus flexilis</i>	<i>Symphoricarpos oreophilus</i>
a <i>Pseudotsuga menziesii</i>	<i>Mahonia repens</i>
	<i>Padus virginiana</i>
<i>Lupinus argenteus</i>	<i>Poa fendleriana</i>
<i>Fragaria vesca</i>	<i>Melica spectabilis</i>
<i>Geranium viscosissimum</i>	<i>Festuca idahoensis</i>
<i>Drymocallis glandulosa</i>	<i>Bromus marginatus</i>
<i>Thalictrum fendleri</i>	

- w Wyoming, 7820-7860 ft. (Youngblood and Mueggler 1981)
- Shoshone NF
- se Idaho, lower elevations (Mueggler and Campbell 1982)
- se Oregon, 5000-7000 ft. (Dealy et al. 1981)
- c Oregon, 6000-7100 ft. (Dealy 1971)

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Potr1/Caru1

Populus tremuloides/Calamagrostis rubescens p.a.

Lower slopes and flat alluvial benches, moderately steep slopes, cool and dry, thin loam soils, pH 5.2-5.4, 5600-5800 ft.

d <i>Populus tremuloides</i>	<i>Symphoricarpos oreophilus</i>
a <i>Pinus contorta</i>	
a <i>Pseudotsuga menziesii</i>	
<i>Achillea lanulosa</i>	<i>Calamagrostis rubescens</i>
<i>Vicia americana</i>	<i>Elymus glaucus</i>
<i>Thalictrum fendleri</i>	<i>Poa nemoralis</i>
	<i>Carex geveri</i>

- se Idaho, 5600-8200 ft. (Mueggler and Campbell 1982)
- w Wyoming, 6200-8500 ft. (Youngblood and Mueggler 1981)
- Routt NF, 8600-8800 ft. (Hoffman and Alexander 1980)
- Medicine Bow NF, 8100-8600 ft. (Wirsing 1973, Alexander et al. 1986)

ALSO SEE: - Psme/Caru1

- Abia-Pien1/Carul

10501 Potrl/Cagel

Potr1/Cagel

d <i>Populus tremuloides</i>	<i>Juniperus communis</i> <i>Rosa woodsii</i> <i>Amelanchier alnifolia</i> <i>Mahonia repens</i> <i>Symphoricarpos oreophilus</i>
<i>Arnica cordifolia</i> <i>Lathyrus leucanthus</i> <i>Thalictrum</i> spp. <i>Fragaria</i> spp. <i>Osmorhiza occidentale</i> <i>Galium septentrionale</i> <i>Achillea lanulosa</i> <i>Vicia americana</i>	<i>Carex geyeri</i> <i>Bromus porteri</i> <i>Elymus trachycaulus</i> <i>Stipa lettermanii</i> <i>Poa nemoralis</i> <i>Elymus glaucus</i>

The community reported from the Arapaho and Roosevelt NFs and from the Gunnison NF has a predominance of *Ligusticum porteri*, and probably is very closely related to *Potri/Lipo*. This community also contains *Bromus carinatus*, *Festuca thurberi*, *Agropyron* sp., and *Geranium caespitosum*, but little *Arnica cordifolia* or shrubs. On the other hand, the community reported from the Medicine Bow NF, White River NF, and San Juan NF seems to be closer to a true *Potri/Cagel* p.a., with *Elmus glaucus*, *Achillea lanulosa*, and *Arnica cordifolia*.

10516	Potr1/Ceve
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Coarse to very coarse, very well-drained rocky soils, 0-50% (avg. 22%) slopes, absent from n slopes, 8000-8760 ft., average 38 cm to bedrock or large rocks.

d <i>Populus tremuloides</i>	<i>Amelanchier alnifolia</i>
	<i>Ceanothus velutinus</i>
	<i>Paxistima myrsinites</i>
	<i>Rosa woodsii</i>
	<i>Sorbus scopulina</i>

exchange -- Black Hills NF, 5420-5700 ft. (Steinauer 1984, Hoffman 1985).

2. *Aralia nudicaulis* more conspicuous (Hoffman 1985)

ALSO SEE: - Potrl/Prvi phase Syal-Beoc

- Potrl/Bepa c.t. from sw North Dakota (Girard 1985), one stand without any *Corylus*.

- Quma/Syoc

- Potrl/Cocol c.t. apparently seral to Douglas-fir and/or blue spruce, from Pike NF (Powell 1985)

10522 Potrl/Fearl

Populus tremuloides/*Festuca arizonica* p.a.

Stationary screes in meadows, Cryoborolls.

d *Populus tremuloides*

Lupinus argenteus

Festuca arizonica

Festuca thurberi

Muhlenbergia montana

- Gunnison NF, 9750 ft. (Komarkova 1986)

- n Arizona

10503 Potrl/Feth

Populus tremuloides/*Festuca thurberi* p.a.

= Potrl/Feth/Cagel h.t. (Hess & Wasser 1982)

Within drainage areas suitable for snow accumulation, relatively warm dry sw-s slopes, moderately steep (20-75%). pH 6.0-7.4, 8500-9400 ft.

d *Populus tremuloides*

Lathyrus leucanthus

Vicia americana

Achillea lanulosa

Erigeron speciosus

Thalictrum fendleri

Galium septentrionale

Campanula rotundifolia

Symphoricarpos oreophilus

Rosa woodsii

Festuca thurberi

Carex geyeri

Poa nemoralis

Elymus trachycaulus

Bromus porteri

Stipa nelsonii

- Arapaho NF, 8750-9320 ft. (Hess 1981, Wasser and Hess 1982, Hess and Alexander 1986)

- Roosevelt NF

- Routt NF (Terwilliger et al. 1979)

- White River NF, 8530-8940 ft. (Hess and Wasser 1982)

- Uncompahgre NF

- Gunnison NF, 9200-10500 ft. (Johnston and Hendzel 1985, Komarkova 1986)

- Utah, 8000-9500 ft. (Mueggler and Campbell 1986)

Although reported from the Routt NF by Terwilliger et al. (1979), Hoffman and Alexander (1980) did not show any Potrl p.a. with any Feth in it.

10504 Potrl/Hesp

Populus tremuloides/Heracleum sphondylium p.a.

= Potr1-Ptaq/Hesp assn., in part (Bunin 1975)

= *Potri/Heracleum lanatum* h.t. (Hess & Wasser 1982, Mueggler and Campbell 1986)

Bottomlands and drainages, gently-sloping, often adjacent to streams, on n-ne or various aspects, slope 2-25%, sandy loam to clay loam soils, pH 5.6-7.5, areas of cold-air drainage; deep, well-drained, moderately-permeable soils.

Populus tremuloides	Sambucus racemosa
	Symphoricarpos oreophilus
Heracleum sphondylium	Elymus glaucus
Thalictrum fendleri	Bromus canadensis
Geranium richardsonii	Elymus trachycaulus
Senecio serra	Poa palustris
Osmorhiza occidentalis	Melica spectabilis
Vicia americana	Carex geyeri
Ligusticum porteri	Bromus carinatus
Delphinium barbeyi	
Hydrophyllum fendleri	
Valeriana occidentalis	
Nemophila breviflora	
Aconitum columbianum	
Aster engelmannii	

- Routt NF, 8020-8820 ft. (Hoffman and Alexander 1980, Johnston and Hendzel 1985)
- White River NF, 7850-9520 ft. (Boyce 1977, Hess and Wasser 1982, Hoffman 1982, Wasser and Hess 1982)
- w Wyoming, 8050-8720 ft. (Youngblood and Mueggler 1981)
- Utah, 7000-9300 ft. (Mueggler and Campbell 1986)

10508	Potr1/Juco
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Populus tremuloides/Juniperus communis p.a.

Below lower timberline, n slopes, glacial tills-boulder fields, 7500-8500 ft.

Populus tremuloides	Juniperus communis
a Pinus flexilis	Mahonia repens
a Pinus contorta	Shepherdia canadensis
a Juniperus scopulorum	Symphoricarpos oreophilus
Lupinus argenteus	Poa nervosa
Achillea lanulosa	Poa fendleriana
Arnica cordifolia	Stipa occidentalis
Campanula rotundifolia	Elymus trachycaulus
Astragalus miser	Bromus anomalus

- w Wyoming, 8100-8140 ft. (Youngblood and Mueggler 1981)
- Shoshone NF, 7500-8500 ft.
- ne Utah, ca. 8600 ft. (Henderson et al. 1977)
- Medicine Bow NF, 8800 ft. (Severson 1963)
- Utah, 7500-9300 ft. (Mueggler and Campbell 1986)

10505	Potr1/Lale
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Populus tremuloides/Lathyrus leucanthus p.a.

Moderately mesic, moderate to shallow depth loam soil with very little exposed rock on moderate slopes with east exposure at 8000-9700 ft. elevation.

d <i>Populus tremuloides</i>	<i>Rosa woodsii</i> <i>Mahonia repens</i>
<i>Lathyrus leucanthus</i>	<i>Carex geyeri</i>
<i>Ligusticum porteri</i>	<i>Bromus porteri</i>
<i>Castilleja septentrionalis</i>	<i>Elymus glaucus</i>
<i>Osmorhiza depauperata</i>	<i>Poa</i> spp.
<i>Erigeron</i> spp.	<i>Elymus trachycaulus</i>
<i>Vicia americana</i>	

- Roosevelt NF (Terwilliger et al. 1979)
- Medicine Bow NF, 8000-9100 ft. (Wirsing 1973, Severson 1963)
- Routt NF (Hoffman and Alexander 1980)

Perhaps these stands are *Potri/LIGU* or *Potri/Thfel* from which more palatable forbs have been removed by sheep grazing.

10518 Potr1/LIGU

Populus tremuloides/*Ligusticum* spp. p.a.

- = Potr1/Thfel h.t. phase Lipo (Hess 1981)
= Potr1/Lifi h.t. (Youngblood & Mueggler 1981)

Midslope benches and terraces, alluvial-colluvial, soils poorly-drained, pH 6.0-6.2, 7000-9500 ft.

d <i>Populus tremuloides</i>	
a <i>Abies lasiocarpa</i>	
<i>Ligusticum porteri</i>	<i>Bromus ciliatus</i>
<i>Ligusticum filicinum</i>	<i>Elymus glaucus</i>
<i>Thalictrum fendleri</i>	<i>Melica spectabilis</i>
<i>Geranium richardsonii</i>	<i>Carex occidentalis</i>
<i>Osmorhiza depauperata</i>	<i>Bromus anomalus</i>
<i>Aster engelmannii</i>	
<i>Valeriana occidentalis</i>	
<i>Heracleum sphondylium</i>	
<i>Delphinium</i> spp.	
<i>Achillea lanulosa</i>	
<i>Galium triflorum</i>	
<i>Hydrophyllum fendleri</i>	
<i>Viola nuttallii</i>	
<i>Pseudostellaria jamesiana</i>	
<i>Vicia americana</i>	
<i>Lathyrus leucanthus</i>	
<i>Fragaria</i> spp.	

- White River NF, 9300-9500 ft. (Hoffman 1982)
- Routt NF, 8300-9700 ft. (Hoffman and Alexander 1980, Johnston and Hendzel 1985)
- Medicine Bow NF, 8700 ft. (Wirsing 1973, Ward 1985)
- w Wyoming, 7000-8800 ft. (Youngblood and Mueggler 1981)

- Arapaho NF (Hess 1981)
- Roosevelt NF
- Uncompahgre NF, 9400-10000 ft. (Johnston and Hendzel 1985)
- San Juan NF, 9000-9700 ft. (Johnston and Hendzel 1985)
- San Isabel NF, 9020 ft. (Powell 1985)

In w Wyoming, *Ligusticum filicinum* is dominant; in all the other areas, it is replaced by *Ligusticum porteri*.

10507 Potr1/Luar1

Populus tremuloides/*Lupinus argenteus* p.a.

Clay loam soils, pH 5.9-6.7, deep well-developed soil on more xeric habitat.

<i>Populus tremuloides</i>	<i>Juniperus communis</i>
	<i>Ribes lacustre</i>
	<i>Pentaphylloides floribunda</i>
<i>Lupinus argenteus</i>	<i>Festuca idahoensis</i>
<i>Achillea lanulosa</i>	<i>Roegneria spicata</i>
<i>Astragalus alpinus</i>	<i>Carex scopulorum</i>
<i>Fragaria virginiana</i>	<i>Leucopoa kingii</i>
<i>Lupinus wyethii</i>	<i>Poa nervosa</i>

- s Bighorn NF, 7020-7760 ft. (Hoffman and Alexander 1976)

- Shoshone NF

10520 Potr1/Mare

Populus tremuloides/*Mahonia repens* p.a.

Upland ravines, moderately-steep slopes, and along streams; northerly slopes; sandy loam soils, pH 6.0-6.6.

d <i>Populus tremuloides</i>	<i>Mahonia repens</i>
s <i>Fraxinus pennsylvanica</i>	<i>Padus virginiana</i>
a <i>Pinus ponderosa</i>	<i>Symphoricarpos albus</i>
a <i>Acer negundo</i>	<i>Rubus idaeus</i>
	<i>Symphoricarpos occidentalis</i>
	<i>Toxicodendron rydbergii</i>
	<i>Ribes missouriense</i>
<i>Galium septentrionale</i>	<i>Poa pratensis</i>
<i>Smilacina stellata</i>	<i>Carex sprengelii</i>
<i>Apocynum androsaemifolium</i>	<i>Elymus virginicus</i>
<i>Thalictrum dasycarpum</i>	<i>Elymus trachycaulus</i>
<i>Sanicula marilandica</i>	
<i>Disporum trachycarpum</i>	
<i>Campanula rotundifolia</i>	
<i>Fragaria virginiana</i>	

- sw North Dakota, 3600-3840 ft. (Hansen and Hoffman 1986)

ALSO SEE: - Potr1/Pavi, especially phase Syal

- Potr1/Amal-Pavi

ALSO SEE: - Potrl/Ptaq c.t., apparently seral to Douglas-fir, on the Pike NF (Powell 1985)

10523 Potrl/Sara

= Potri/Sara c.t. (Mueggler and Campbell 1986)

d *Populus tremuloides*
a *Abies lasiocarpa*
a *Picea engelmannii*

Sambucus racemosa
Salix scouleriana

Hydrophyllum fendleri
Lathyrus leucanthus
Thalictrum fendleri
Mertensia spp.
Galium spp.

Bromus carinatus
Elymus glaucus

- Utah, 8000-9000 ft. (Mueggler and Campbell 1986)

10511 Potr1/Svor1

= Potr1/Syor1/Senecio serra/Thfe1 assn. (Boyce 1977)

= Aspen/pachic dark brown loams (Tiedeman 1978)

= Potrl/Syorl/Cagel h.t. (Hess & Wasser 1982, Baker 1982)

= Potrl/Syorl-Caru h.t. (Mueggler & Campbell 1982)

Lower slopes, sheltered slopes, draws, and higher benches, well-developed well-drained soil, moderately steep (8-72%) slopes, 6600-10200 ft. in nw Wyoming, 7400-9700 ft. in c Colorado.

d *Populus tremuloides*

Symphoricarpos oreophilus

a *Abies lasiocarpa*

Rosa woodsii

a *Pseudotsuga menziesii*

Mahonia repens

Achillea lanulosa

Elvymus glaucus

Thalictrum fendleri

Elymus trachycaulus

Geranium richardsonii

Osmorhiza sp.

Fragaria virginiana

A - Shoshone NF, 7520-10170 ft. (Reed 1971, Wasser and Hess 1982)

- nw Wyoming, 6620-8550 ft. (Youngblood and Mueggler 1981, Bartos and Lester 1984)

- n Nevada (Lewis 1975)

- Montana

- se Idaho, 5200-7500 ft. (Mueggler and Campbell 1982)

- c Idaho, below 8500 ft. (Schlatterer 1972)

Lupinus argenteus
Drymocalis glandulosa

Calamagrostis rubescens
Melica spectabilis
Bromus spp.
Poa nervosa

Between Potrl/Amal-Prvi below and coniferous forest above, drier and better-drained than Potrl/Amal-Prvi. These communities include in addition:

Vicia americana
Galium septentrionale
Aster engelmannii
Lathyrus leucanthus

Carex geyeri
Bromus canadensis

10512 Potr1/Thf1

- = Aspen c.t. (Langenheim 1962)
- = Potrl/Thfel/Lale/Elgl assn. (Boyce 1977)
- = Potrl/Thfel h.t. (Hoffman & Alexander 1980, Hess 1981, Hoffman 1982)
- = Potrl/Thfel c.t. (Youngblood & Mueggler 1981)
- = Potrl/Thfel/Cagel h.t. (Hess & Wasser 1982)

d *Populus tremuloides*
a *Pinus flexilis*
a *Abies lasiocarpa*
a *Pseudotsuga menziesii*
a *Pinus contorta*
a *Picea engelmannii*

Rosa woodsii

Thalictrum fendleri
Lathyrus leucanthus
Ligusticum porteri
Vicia americana
Delphinium barbeyi
Lupinus argenteus
Geranium richardsonii

Carex geyeri
Elymus glaucus
Bromus canadensis
Elymus trachycaulus
Poa nemoralis
Bromus porteri
Bromus marginatus

Osmorhiza occidentalis
Smilacina stellata
Galium septentrionale
Senecio serra
Potentilla pulcherrima
Fragaria spp.
Achillea lanulosa
Aster engelmannii

Stipa lettermanii

- w Wyoming, 7400-9120 ft. (Youngblood and Mueggler 1981)
- n Nevada (Lewis 1975)
- Shoshone NF
- Routt NF, 8120-9700 ft. (Hoffman and Alexander 1980, Johnston and Hendzel 1985)
- Arapaho NF, 9400-9800 ft. (Hess 1981, Wasser and Hess 1982, Hess and Alexander 1986)
- Roosevelt NF, 8000-8600 ft. (Terwilliger et al. 1979)
- Gunnison NF, 8400-11200 ft. (Langenheim 1962, Morgan 1969, Komarkova 1986, Johnston and Hendzel 1985)
- White River NF, 8360-10330 ft. (Boyce 1977, Hess and Wasser 1982, Hoffman 1982, Johnston and Hendzel 1985)

This is probably related to *Potrl/Lale*. In particular, the community described by Hess (1981) under the name *Potrl/Thfel* apparently has *Lipo* dominant or codominant in the herb layer (See *Potrl/LIGU*). This p.a. always has a rich assortment of forbs, both in number of species and biomass. The community described by Boyce (1977) also includes *Cirsium eatonii* and *Festuca thurberi*.

PHASES: 1. *Thermopsis divaricata* codominant in the forb layer, with *Juniperus communis*, *Rosa woodsii*, *Mahonia repens*, *Acer glabrum*, and *Symphoricarpos* -- Roosevelt NF (Terwilliger et al. 1979). This phase is reported at lower elevations (8000-8600 ft.), whereas the typical phase is found above 8500 ft.

3. *Urtica dioica* replaces *Thalictrum fendleri* -- White River NF (Boyce 1977)

10513 Potrl/Vete

Populus tremuloides/Veratrum tenuipetalum p.a.

Very wet, sandy loam soil, very poorly drained bottoms, concave slopes, pH 5.6-6.1

Populus tremuloides

Veratrum tenuipetalum
Hydrophyllum capitatum
Ligusticum porteri
Heracleum sphondylium
Mertensia ciliata
Thalictrum fendleri
Ranunculus alismaefolius

Bromus canadensis
Poa palustris
Bromus porteri

- Routt NF, 8500-8800 ft. (Hoffman and Alexander 1980, Johnston and Hendzel 1985)
- Arapaho NF
- San Juan NF, 9500-9800 ft. (Johnston and Hendzel 1985)
- Utah (Mueggler and Campbell 1986)

QUERCUS MACROCARPA SERIES (106)

10603

Quma/CORY3

Quercus macrocarpa/Corylus spp. p.a.

Level to gentle lower slopes of isolated buttes, sandy loam soils, pH 7.0-7.5

Quercus macrocarpa	Prunus virginiana
Fraxinus pennsylvanica	Corylus americana
a Ulmus americana	Corylus cornuta
a Populus tremuloides	Symphoricarpos occidentalis
	Amelanchier alnifolia
	Ribes missouriense
Viola canadensis	Carex spp.
Galium septentrionale	Schizachne purpurascens
Aralia nudicaulis	
Apocynum androsaemifolium	

- sw North Dakota (Girard 1985)
- Thunder Basin NG (Steward 1984)

ALSO SEE: - Quma/Syoc
- Potr1/Coco1
- Bepa/Coco1
- Erpe/Pavi

10601 Quma/Syoc

Quercus macrocarpa/*Symphoricarpos occidentalis* p.a.

- = Quma/Rhtr p.a. (Terwilliger et al. 1979)
= Quma/Prvi h.t. (Girard 1985)

Deciduous riparian in glaciated areas, foothills and uplands between mixed grass and montane forest eastward along intermittent streams, precip. 15-19 in/yr, 3500-4000 ft., pH 5.6-7.0, loam soils.

d <i>Quercus macrocarpa</i>	<i>Symphoricarpos occidentalis</i>
s <i>Alnus incana</i>	<i>Padus virginiana</i>
a <i>Ostrya virginiana</i>	<i>Mahonia repens</i>
a <i>Salix amygdaloides</i>	<i>Rosa woodsii</i>
a <i>Fraxinus pennsylvanica</i>	<i>Amelanchier alnifolia</i>
	<i>Ribes</i> spp.
<i>Galium septentrionale</i>	<i>Carex foenea</i>
<i>Viola</i> spp.	<i>Carex sprengelii</i>
<i>Lathyrus ochroleucus</i>	<i>Carex</i> spp.
<i>Vicia americana</i>	<i>Poa</i> spp.
<i>Geranium richardsonii</i>	
<i>Arnica cordifolia</i>	
<i>Psoralea esculenta</i>	

- Black Hills NF, 3500-4200 ft. (Terwilliger et al. 1979, Olson and Gerhart 1982, Black Hills NF 1985, Steinauer 1984, Hoffman 1985)
- sw North Dakota (Girard 1985)

PHASE: 1. *Populus tremuloides* conspicuous seral tree on more unstable soils, with considerably less *Padus virginiana*; *Acer negundo* and *Viburnum lentago* may be present; *Sanicula marilandica*, *Lathyrus ochroleucus*, and *Viola canadensis* are more abundant -- sw North Dakota (Girard 1985).

ALSO SEE: - Quma/CORY3

[illegible]

2. WOODLANDS

JUNIPERUS SCOPULORUM SERIES (203)

20302 Jusc/Artr
 Juniperus scopulorum/Artemisia tridentata p.a.

Rocky and boulder outcrops, steep to very steep (45-77%) s slopes, xeric forest, gneiss-schist colluvium-residuum, pH 7.0-7.6, 7900-8600 ft.

d Juniperus scopulorum	Artemisia tridentata
a Pinus ponderosa	Ribes cereum
a Pseudotsuga menziesii	Artemisia frigida
	Leptodactylon pungens
	Opuntia polyacantha
Penstemon virens	Leymus ambiguus
Drymocallis fissa	Oryzopsis hymenoides
Eriogonum umbellatum	Carex rossii
	Oryzopsis micrantha
	Stipa comata

- Roosevelt NF (Hess 1981, Wasser and Hess 1982, Hess and Alexander 1986)

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20304 Jusc/Cemo  
 Juniperus scopulorum/Cercocarpus montanus p.a.

Exposed rocky and boulder outcrops, steep (45-65%) slopes, n aspects or sometimes s slopes where slope less steep, shallow loamy sands with high gravel content, 6200-6950 ft.

|                      |                       |
|----------------------|-----------------------|
| Juniperus scopulorum | Cercocarpus montanus  |
|                      | Ribes cereum          |
|                      | Artemisia frigida     |
|                      | Opuntia polyacantha   |
| Drymocallis fissa    | Elytrigia dasystachya |
| Heuchera bracteata   | Stipa comata          |
| Penstemon virens     | Poa secunda           |
| Eriogonum umbellatum | Bouteloua gracilis    |
| Pulsatilla patens    |                       |

- Roosevelt NF (Terwilliger et al. 1979, Hess 1981, Wasser and Hess 1982, Hess and Alexander 1986)

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20301 Jusc/Elsm
 Juniperus scopulorum/Elytrigia smithii p.a.

Dry slopes and rocky ridges below timberline.

Juniperus scopulorum	
Phlox hoodii	Elytrigia smithii
Astragalus miser	Roegneria spicata
Erigeron caespitosus	Poa secunda
Eremogone congesta	Koeleria macrantha
Antennaria rosea	

- Shoshone NF (Terwilliger et al. 1979)

20307 Jusc/Ormi

Juniperus scopulorum/*Oryzopsis micrantha* p.a.

Northerly upper steep slopes, butte tops, and ridges, or savanna-like steep scoria or shale slopes, shrubs in openings, high moss and lichen cover, 38-67% n-nw slopes, sandy loam-clay loam-loam soils, pH 6.7-7.9

d *Juniperus scopulorum*
a *Fraxinus pennsylvanica*

Rhus aromatica spp. *trilobata*
Symphoricarpos occidentalis
Padus virginiana
Rosa woodsii
Mahonia repens
Ribes cereum
Symphoricarpos albus
Juniperus communis

mosses and lichens
Galium septentrionale
Achillea lanulosa
Smilacina stellata
Woodsia spp.
Campanula rotundifolia
Antennaria rosea
Viola adunca
Solidago gigantea

Oryzopsis micrantha
Elymus trachycaulus
Carex heliophila
Koeleria macrantha
Elytrigia dasystachya

- sw North Dakota, 2080-3600 ft. (Hansen et al. 1984, Girard 1985, Hansen and Hoffman 1986, Nelson 1961)
- Buffalo Gap NG
- sc South Dakota

20306 Jusc/Putr

Juniperus scopulorum/*Purshia tridentata* p.a.

Rocky and boulder outcrops on e-s-w slopes, steep xeric (50-170%) slopes, pH 6.6-6.8, 7050-8200 ft.

d *Juniperus scopulorum*
a *Pseudotsuga menziesii*

Purshia tridentata
Rubus deliciosus
Opuntia polyacantha
Artemisia frigida

Helianthus pumilus
Dryocallis fissa
Artemisia ludoviciana
Heterotheca villosa
Eriogonum umbellatum

Carex rossii
Stipa comata
Elytrigia dasystachya
Muhlenbergia montana
Bouteloua gracilis

- Roosevelt NF (Terwilliger et al. 1979, Hess 1981, Wasser and Hess 1982, Hess and Alexander 1986)

20303 Jusc/Rosp

Juniperus scopulorum/*Roegneria spicata* p.a.

Moderate to steep, northerly 38-70% slopes, cobbly and stony soils on slopes with extensive bare ground, loams to clay loams, pH 7.2-7.7.

d *Juniperus scopulorum*
a *Pinus ponderosa*

Artemisia tridentata ssp. *wyomingensis*
Purshia tridentata
Chrysothamnus viscidiflorus
Rhus trilobata
Gutierrezia sarothrae

Balsamorhiza sagittata
Heterotheca villosa
Mertensia lanceolata
Opuntia polyacantha
Penstemon spp.
Phlox spp.
Senecio multilobatus
Achillea lanulosa

Roegneria spicata
Bouteloua gracilis
Festuca idahoensis
Koeleria macrantha
Oryzopsis hymenoides
Poa fendleriana
Carex filifolia
Elymus elymoides

- Shoshone NF (Terwilliger et al. 1979)
- Medicine Bow NF
- Bighorn NF
- Routt NF
- Arapaho NF
- nc Colorado, 7600-8300 ft. (Terwilliger and Tiedeman 1978, Strong 1980, Tiedeman et al. 1987)
- se Montana, 3240-3440 ft. (Brown 1971, Hansen and Hoffman 1986)

PINUS EDULIS-JUNIPERUS SPP. SERIES (201, 202, 204)

20403

Pied-Juos/Amut-Cemo

Pinus edulis-*Juniperus osteosperma*/Amelanchier *utahensis*-*Cercocarpus montanus* p.a.

- = Juos-Pied/Amut-Cemo marlstone barren (Baker 1982)
- = Pied-Amut-Arpa-Cemo/Capi h.t. (Baker 1982)

Lower elevations, slopes above broad valleys, sw-s-se slopes, moderately steep (37-75%), shallow well-drained soils, barrens and rock outcrops, pH 8.0-8.4, 6480-8040 ft.

d *Pinus edulis*
d *Juniperus osteosperma*

Cercocarpus montanus
Amelanchier utahensis
Quercus gambelii
Symphoricarpos oreophilus

Cryptantha minima
Physaria acutifolia
Senecio multilobatus
Phlox austromontana

Oryzopsis hymenoides
Leymus cinereus

- White River NF, 6890-7870 ft. (Hess and Wasser 1982, Wasser and Hess 1982)
- nw Colorado, 6840-8040 ft. (Baker 1982)
- sw Utah, 7000-7400 ft. (Medany and West 1984)

There are no forb species of high constancy; the ones listed above are the most conspicuous. The forb and grass layers are typically very poorly developed; large, open expanses of bare, light-colored rock are evident.

PHASE: 1. *Arctostaphylos patula* codominant, with additional *Carex pityophila* and *Ceanothus martinii*, on flat to gently sloping

marlstone -- nw Colorado, 6890-8040 ft. (Baker 1982; sw Utah
(Medany and West 1984)

ALSO SEE: - Pied-Jumo/Cemo
- Pied-Juos/Cemo

20410 Pied/Arno

Pinus edulis/*Artemisia nova* p.a.

= *Pipo*/*Artemisia arbuscula* h.t. (De Velice et al. 1985)

Lower benches, frigid soils.

d <i>Pinus edulis</i>	<i>Artemisia nova</i>
d <i>Juniperus scopulorum</i>	<i>Quercus gambelii</i>
a <i>Pinus ponderosa</i>	<i>Symphoricarpos oreophilus</i>
<i>Erigeron flagellaris</i>	<i>Carex heliophila</i>
	<i>Koeleria macrantha</i>
	<i>Muhlenbergia montana</i>
	<i>Elymus elymoides</i>
	<i>Bouteloua gracilis</i>

- n New Mexico, 8250 ft. (De Velice et al. 1985)

The *Artemisia* is assumed to be *A. nova*. This p.a. might be better called Pied-JUNI/Cahel, when more plots have been sampled. It is not known why *Juniperus osteosperma* was not mentioned.

20401 Pied-Juos/Artr

Pinus edulis-*Juniperus osteosperma*/*Artemisia tridentata* p.a.

= High-elevation pinyon-juniper/shallow sandy loams (Tiedeman 1978)

Relatively high elevations, 7000-8000 ft., just below mountain shrub zone; shallow, sandy soil, commonly over sandstone, slopes up to 30%, variety of aspects except south, precip. 13-16 in/yr, pH 7.3-7.6.

d <i>Pinus edulis</i>	<i>Artemisia tridentata</i>
d <i>Juniperus osteosperma</i>	<i>Cercocarpus montanus</i>
	<i>Amelanchier utahensis</i>
	<i>Opuntia polyacantha</i>
	<i>Opuntia fragilis</i>
<i>Phlox longifolia</i>	<i>Poa fendleriana</i>
<i>Phlox multiflora</i>	<i>Poa longiligula</i>
lichens	<i>Koeleria cristata</i>
<i>Erigeron subtrinervis</i>	<i>Oryzopsis hymenoides</i>
<i>Leucelene ericoides</i>	<i>Elytrigia smithii</i>
	<i>Stipa comata</i>

- nw Colorado, 6000-7000 ft. (Tiedeman 1978)

- White River NF (Terwilliger et al. 1979)

- Grand Mesa NF

- Gunnison NF

- Uncompahgre NF

- San Juan NF

- n Arizona, 5800-6000 ft. (Rasmussen 1941, Brotherson et al. 1983)

Poa longiligula is very closely related to *Poa fendleriana*.

PHASE: 1. *Bouteloua gracilis* replaces *Agropyron*, and *Hilaria jamesii* or *Muhlenbergia pungens* sometimes important associates -- San Juan NF (Terwilliger et al. 1979), ne Arizona (Brotherson et al. 1983). This is possibly related to Pied/Bogr p.a.

ALSO SEE: - Pied-Juos/Pofe

20202 Juos/Artr
Juniperus osteosperma/*Artemisia tridentata* p.a.

Shallow rocky soils at low elevations just above break in slope between foothills and valley floor.

<i>Juniperus osteosperma</i>	<i>Artemisia tridentata</i>
<i>Pinus flexilis</i>	<i>Artemisia nova</i>
	<i>Gutierrezia sarothrae</i>
	<i>Opuntia</i> spp.
<i>Allium textile</i>	<i>Roegneria spicata</i>
<i>Calochortus nuttallii</i>	<i>Bouteloua gracilis</i>
<i>Phlox hoodii</i>	<i>Carex filifolia</i>
<i>Plantago patagonica</i>	<i>Poa secunda</i>

- Bighorn NF (Terwilliger et al. 1979)
- nw Utah, 5200-7400 ft. (Ream 1964)

20101 Jumo/Bocu
Juniperus monosperma/*Bouteloua curtipendula* p.a.

Shallow soils with shattered bedrock or deep rock soils, rocky break topography.

<i>Juniperus monosperma</i>	
<i>Pinus edulis</i>	
	<i>Bouteloua curtipendula</i>
	<i>Andropogon gerardii</i>
	<i>Schizachyrium scoparium</i>
	<i>Muhlenbergia wrightii</i>

- San Isabel NF (Terwilliger et al. 1979)

20402 Pied/Bogr
Pinus edulis/*Bouteloua gracilis* p.a.

Relatively high elevations, upper slopes, open forested stands, moderately flat to steep rocky slopes or gently-rolling hills, 10-53% slope on se-sw aspects, 5100-9400 ft.

d <i>Pinus edulis</i>	<i>Artemisia frigida</i>
a-d <i>Juniperus scopulorum</i>	<i>Yucca glauca</i>
a-d <i>Juniperus monosperma</i>	<i>Ribes cereum</i>
	<i>Opuntia polyacantha</i>
<i>Picradenia richardsonii</i>	<i>Bouteloua gracilis</i>
<i>Eriogonum</i> spp.	<i>Stipa comata</i>
	<i>Muhlenbergia montana</i>
	<i>Poa fendleriana</i>
	<i>Carex eleocharis</i>
	<i>Oryzopsis hymenoides</i>
	<i>Bouteloua curtipendula</i>

- Rio Grande NF, 8320-9400 ft. (Shepherd 1975)
- San Isabel NF (Terwilliger et al. 1979)
- nw New Mexico, 5000-8500 ft. (Wright et al. 1973, Francis 1986)
- sc New Mexico, 5100-7600 ft. (Kennedy 1983)
- ne Arizona (Jameson 1966)

The Rio Grande NF sites have *Artemisia carruthii*, *Atriplex canescens*, *Cercocarpus montanus*, *Stipa comata*, *Carex obtusata*, *Festuca arizonica*, and *Muhlenbergia filiculmis*. On the other hand, those in the San Isabel NF have *Chrysothamnus nauseosus*, *Gutierrezia sarothrae*, *Ceanothus fendleri*, *Erigeron canus*, and *Elytrigia smithii*. The New Mexico communities have exclusively *Juniperus monosperma*; to the north mixtures occur with *Juniperus scopulorum*. *Quercus undulata* increases with grazing use.

ALSO SEE: - Pied/Artr phase Bogr.

20102 Jumo/Bogr

Juniperus monosperma/Bouteloua gracilis p.a.

Lower elevation Pinon-Juniper sites, shallow loam or sandy-loam soils. pH 7.5, precipitation ca. 12 in/yr.

d <i>Juniperus monosperma</i>	<i>Opuntia polyacantha</i>
a <i>Pinus edulis</i>	<i>Opuntia imbricata</i>
	<i>Gutierrezia sarothrae</i>
	<i>Artemisia frigida</i>
	<i>Yucca glauca</i>
	<i>Quercus undulata</i>
<i>Evolvulus nuttallianus</i>	<i>Bouteloua gracilis</i>
<i>Psoralea</i> sp.	<i>Hilaria jamesii</i>
<i>Erigeron</i> spp.	<i>Sporobolus cryptandrus</i>
<i>Gilia</i> spp.	<i>Aristida longiseta</i>
<i>Gaura</i> sp.	<i>Elytrigia smithii</i>
<i>Sphaeralcea coccinea</i>	<i>Stipa neomexicana</i>
<i>Picradenia richardsonii</i>	<i>Bouteloua curtipendula</i>
<i>Plantago patagonica</i>	<i>Oryzopsis hymenoides</i>
	<i>Koeleria macrantha</i>
	<i>Bouteloua eriopoda</i>

- San Isabel NF (Terwilliger et al. 1979)
- Comanche NG, ca. 4500 ft.
- nw New Mexico, 5900-6600 ft. (Wright et al. 1973, Francis 1986)

ALSO SEE: - Jumo/Elsm

20407 Pied-Jumo/Cemo

Pinus edulis-Juniperus monosperma/Cercocarpus montanus p.a.

= Pied-Jumo/Cemo/Ange h.t. (Kennedy 1983)

Moderate to steep, s-w aspects, rocky-cobbly surface, mid- to upper slopes and outcrops.

d <i>Pinus edulis</i>	<i>Cercocarpus montanus</i>
a-d <i>Juniperus monosperma</i>	<i>Rhus aromatica</i> spp. <i>trilobata</i>
	<i>Yucca baccata</i>
	<i>Bouteloua gracilis</i>

Bouteloua curtipendula
Andropogon gerardii

- sc New Mexico, 5200-7600 ft. (Kennedy 1983)
- Rio Grande NF
- San Isabel NF

20409 Pied-Juos/Cemo

Pinus edulis-Juniperus osteosperma/Cercocarpus montanus p.a.

Relatively closed canopy of pinyon-juniper, with sparse herbaceous layer, fine sandy loam derived from sandstone.

d Juniperus osteosperma	Cercocarpus montanus
d Pinus edulis	Yucca baccata
	Symphoricarpos oreophilus
	Fendlera rupicola
	Opuntia polyacantha
	Poa fendleriana

- Mesa Verde NP, 7600 ft. (Erdman 1970)

ALSO SEE: - Pied-Jumo/Cemo
- Pied-Juos/Amut-Cemo

PHASE: 1. Quercus gambelii -- Arizona and New Mexico (Moir and Carleton 1986)

20203 Juos/Cemo-Pera2

Juniperus osteosperma/Cercocarpus montanus-
Peraphyllum ramosissimum p.a.

Mixed, frigid Ustorthents; lower elevations, s-facing steep to very steep slopes (18-68%), pH 7.4-8.4, shales-sandstones, 6400-7700 ft.

d Juniperus osteosperma	Peraphyllum ramosissimum
a-d Pinus edulis	Cercocarpus montanus
	Symphoricarpos oreophilus
	Quercus gambelii
	Amelanchier utahensis
Eriogonum microthecum	Oryzopsis hymenoides
Physaria acutifolia	Elymus elymoides
Arabis drummondii	Roegneria spicata var. inerme
Cryptantha virgata	
Lepidium montanum	
Mertensia lanceolata	
Trifolium gymnocarpon	

- nw Colorado, 6500-7500 ft. (Baker 1982)
- White River NF, 6400-7700 ft. (Hess and Wasser 1982, Wasser and Hess 1982)

There are no forb species of high constancy in this community. Usually there is a mixture of several of the species listed above.

PHASE: 1. Artemisia tridentata ssp. wyomingensis on gentler slopes with deeper soils.

ALSO SEE: - Pied-Jumo/Cemo

20103 Jumo/Elsm

Juniperus monosperma/*Elytrigia smithii* p.a.

Rolling hills and plateaus, break slopes or mesa tops, Aridisols, pH 8.2.

d <i>Juniperus monosperma</i>	<i>Gutierrezia sarothrae</i>
	<i>Artemisia tridentata</i>
	<i>Elytrigia smithii</i>
	<i>Bouteloua gracilis</i>
	<i>Hilaria jamesii</i>
	<i>Sporobolus cryptandrus</i>
	<i>Sporobolus airoides</i>
	<i>Aristida longiseta</i>

- ne Arizona (Arnold 1964)

- nw New Mexico, 6600 ft. (Francis 1986)

ALSO SEE: - Jumo/Bogr

20205 Juos/Mafr

Juniperus osteosperma/*Mahonia fremontii* p.a.

Hot, dry slopes, southerly, Entisols.

d <i>Juniperus osteosperma</i>	<i>Mahonia fremontii</i>
a <i>Populus tremuloides</i>	<i>Symphoricarpos oreophilus</i>
	<i>Rosa woodsii</i>
<i>Senecio serra</i>	<i>Carex geyeri</i>
<i>Viola canadense</i>	<i>Poa nemoralis</i> spp. interior
<i>Frasera speciosa</i>	<i>Elymus trachycaulus</i>
<i>Geranium richardsonii</i>	<i>Stipa pinetorum</i>

- Gunnison NF, 7160 ft. (Komarkova 1986)

20204 Juos/Orhy

Juniperus osteosperma/*Oryzopsis hymenoides* p.a.

= Low-elevation pinyon-juniper/shallow very gravelly sandy loams (Tiedeman 1978)

Low elevations in nearly all western Colorado River drainages, 4600-7000 ft. Very gravelly, cobbly shallow soils, characteristic gravel pavement, more commonly over shale, precip. 13-16 in/yr, 6000-7300 ft., pH 7.7-7.8.

d <i>Juniperus osteosperma</i>	<i>Artemisia tridentata</i>
a <i>Pinus edulis</i>	<i>Chrysothamnus viscidiflorus</i>
<i>Phlox multiflora</i>	<i>Oryzopsis hymenoides</i>
<i>Arenaria eastwoodiae</i>	<i>Poa fendleriana</i>
<i>Physaria</i> sp.	<i>Elytrigia smithii</i>
<i>Machaeranthera grindelioides</i>	<i>Elymus elymoides</i>
<i>Astragalus chamaeleuce</i>	

- White River NF (Terwilliger et al. 1979)

- Grand Mesa NF

- Uncompahgre NF
- Gunnison NF
- San Juan NF
- nw Colorado, 6000-7300 ft. (Tiedeman 1978)

This community may be found below the Forest boundary in most cases. It seems to be similar to Pied/Artr, but at lower elevations on gravelly, cobbly soils.

20406 Pied-Juos/Pofe

Pinus edulis-Juniperus osteosperma/Poa fendleriana p.a.

Gentle n-facing slopes and mesa tops, loam soils, noncalcaeous, high silt and clay content, precipitation 15-16 in/yr.

d <i>Pinus edulis</i>	<i>Yucca baccata</i>
d <i>Juniperus osteosperma</i>	<i>Opuntia polyacantha</i>
<i>Eriogonum</i> spp.	<i>Poa fendleriana</i>
<i>Astragalus</i> spp.	<i>Koeleria macrantha</i>
<i>Mertensia oblongifolia</i>	
<i>Stenotus acaulis</i>	

- Mesa Verde NP, 7150 ft. (Erdman et al. 1969)
- nw Colorado, 6000-6500 ft. (Baker 1982)
- Arizona and New Mexico (Moir and Carleton 1986)

ALSO SEE: - Pied-Juos/Artr

20405 Pied-Juos/Putr

Pinus edulis-Juniperus osteosperma/Purshia tridentata p.a.

Flat mesa tops, broad level ridgetops, fine sandy loams to sandy loams, shales and sandstones parent rock, very sparse cover of grasses and forbs, precipitation 9-14 in/yr.

d <i>Pinus edulis</i>	<i>Purshia tridentata</i>
d <i>Juniperus osteosperma</i>	<i>Artemisia nova</i>
	<i>Ephedra viridis</i>
	<i>Chrysothamnus viscidiflorus</i>
	<i>Yucca baccata</i>
	<i>Opuntia</i> sp.
	<i>Amelanchier utahensis</i>
<i>Astragalus wingatanus</i>	<i>Poa fendleriana</i>
<i>Phlox hoodii</i>	
<i>Arabis selbyi</i>	
<i>Crepsis acuminata</i>	
<i>Comandra umbellata</i>	
<i>Lithospermum</i> sp.	

- Mesa Verde NP, 6650 ft. (Erdman et al. 1969)
- nw Utah, 6460 ft. (Austin et al. 1984)
- Arizona and New Mexico (Moir and Carleton 1986)

20404 Pied/Quga

Pinus edulis/Quercus gambelii p.a.

= Pied/Quga/Cagel h.t. (Hess & Wasser 1982)

More moist pinon-juniper sites, mixed frigid Ustorthents; relatively mesic, lower elevations, not s-slopes, steep (34-72%), deep well-drained soils, 6890-7870 ft.

d <i>Pinus edulis</i>	<i>Quercus gambelii</i>
<i>Juniperus osteosperma</i>	<i>Amelanchier utahensis</i>
<i>Abies concolor</i>	<i>Symphoricarpos oreophilus</i>
<i>Pinus ponderosa</i>	<i>Cercocarpus montanus</i>
a <i>Pseudotsuga menziesii</i>	<i>Artemisia tridentata</i>
	<i>Carex geyeri</i>
	<i>Carex rossii</i>
	<i>Oryzopsis hymenoides</i>

- San Juan NF (Steinhoff 1978)
- White River NF, 6890-7870 ft. (Hess and Wasser 1982, Wasser and Hess 1982)
- c Utah, 6600-7200 ft. (Mason et al. 1967)
- nc Arizona, 7000 ft. (Merkle 1952)
- New Mexico (Moir and Carleton 1986)

The San Juan NF and c Utah communities include *Cercocarpus ledifolius*, *Festuca arizonica*, *Agropyron* spp., *Koeleria cristata*, *Poa* spp., *Aster* sp., *Artemisia frigida*, and *Achillea lanulosa*. The White River NF community has in addition *Balsamorhiza sagittata*, *Vicia americana*, and *Sitanion hystrix*.

ALSO SEE: - *Pinus discolor*-*P. ponderosa*/*Quercus gambelii* at 6000-6200 ft. in se Arizona (De Velice and Ludwig 1983)

- Pipo/Quga

- Pied-Quga-Gutierrezia sarothrae, with *Hilaria jamesii* and *Sporobolus nealleyi*, from nw New Mexico at 6000 ft. (Francis 1986)

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20201 Juos-Pied/Rosp  
*Juniperus osteosperma*-*Pinus edulis*/*Roegneria spicata* var. *inermis* p.a.

Gently sloping ridgetops and low hills, often southerly, low elevation in nearly all western Colorado River drainages, 5580-7100 ft. Very shallow soil developed on shale.

|                                     |                                                      |
|-------------------------------------|------------------------------------------------------|
| d <i>Juniperus osteosperma</i>      | <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> |
| d <i>Pinus edulis</i>               | <i>Chrysothamnus viscidiflorus</i>                   |
|                                     | <i>Artemisia nova</i>                                |
| <i>Machaeranthera grindelioides</i> | <i>Roegneria spicata</i> var. <i>inermis</i>         |
| <i>Phlox hoodii</i>                 | <i>Leymus ambiguus</i>                               |
| <i>Cryptantha sericea</i>           | <i>Oryzopsis hymenoides</i>                          |
| <i>Gilia spicata</i>                | <i>Poa fendleriana</i>                               |
| <i>Penstemon</i> spp.               | <i>Koeleria macrantha</i>                            |
| <i>Physaria</i> spp.                | <i>Poa secunda</i>                                   |
| <i>Phlox longifolia</i>             |                                                      |

- nc Wyoming (Fisser et al. 1979)
- nw Colorado, 5580-7100 ft. (Baker 1982)
- White River NF (Terwilliger et al. 1979)
- Grand Mesa NF
- Uncompahgre NF
- Gunnison NF
- se Idaho (Harniss and West 1973)



Perhaps this community is found below the Forest boundary in most cases. The Wyoming and Idaho communities are missing *Pinus edulis*, as they are outside its range.

~~~~~  
20408

Pied-Jumo/Stnel
Pinus edulis-*Juniperus monosperma*/*Stipa nelsonii* p.a.
= *Pied-Jumo*/*Stipa columbiana* h.t. (Kennedy 1983)

Gentle slopes, southerly aspects, upper slopes and ridges, less rocky soils than other pinyon-juniper types, extensive litter layer, deeper soils.

d <i>Pinus edulis</i>	<i>Quercus undulata</i>
d <i>Juniperus monosperma</i>	
	<i>Stipa nelsonii</i>
	<i>Elymus elymoides</i>
	<i>Bouteloua gracilis</i>
	<i>Bouteloua curtipendula</i>

- sc New Mexico, 6800-7300 ft. (Kennedy 1983)
~~~~~



### 3. SHRUBLANDS

## ACER GLABRUM SERIES (330)

33001

Acg1/Swse

Acer glabrum/Swida sericea p.a.

Coarse, steep scree slopes in canyons, in moist, protected sites, pH 6.2.

Acer glabrum  
Swida sericea  
Ribes wolfii  
Holodiscus dumosus  
Rubus idaeus

Thalcitrum sparsiflorum  
Smilacina amplexicaulis  
Senecio spp.

- Gunnison NF, 8680 ft. (Komarkova 1986)

[illegible]

## ALNUS INCANA SPP. TENUIFOLIA SERIES (323)

32301

Alint-Befo/SALI

*Alnus incana* spp. *tenuifolia*-*Betula fontinalis*/*Salix* spp. p.a.

= *Alte-Betula occidentalis*/SALI p.a. (Terwilliger et al. 1979)

= Alte/Egar h.t. (Hess 1981)

Common along banks of narrow, slow-moving streams of montane zone at 6900-9000 ft. elevation. Deep, moist alluvial or fluvial soils on nearly level terrain with high watertable support dense woody and herb mixture. Restricted to narrow margins of stream banks.

- a *Picea pungens*
- a *Pseudotsuga menziesii*
- a *Populus tremuloides*
- a *Pinus ponderosa*
- a *Populus angustifolia*

Alnus incana spp. tenuifolia  
 Betula fontinalis  
 Salix exigua  
 S. depressa spp. rostrata  
 Salix geyeriana  
 Salix monticola  
 Rosa woodsii  
 Acer glabrum  
 Ribes spp.

Equisetum arvense  
Sidalcea candida  
Potentilla spp.  
Heracleum sphondylium  
Smilacina stellata  
Cardamine cordifolia

Carex nebrascensis  
Calamagrostis canadensis  
Poa spp.  
Juncus arcticus

- ne Colorado, above 6100 ft. (Bunin 1986)
- Roosevelt NF, 6900-8530 ft. (Hess 1981, Alexander 1981A, Wasser and Hess 1982)
- Arapaho NF
- Medicine Bow NF

- nw Wyoming
- Shoshone NF, 7500-8000 ft. (Olson and Gerhart 1982)
- e Idaho (Youngblood et al. 1985)

This may be present on the Black Hills NF (Hayward 1928:404-5). Except for tree cover or narrowleaf cottonwood, this is very similar to Poan3/Saex-Befo p.a. Usually, two species of *Salix* are present on a given site, but which two species varies from district to district.

ALSO SEE: - *Alnus/Ribes hudsonianum* c.t. from w Wyoming and c Idaho below 6700 ft. (Youngblood et al. 1985), with *Alnus incana* spp. *tenuifolia*, *Cornus stolonifera*, and a variable herbaceous layer.

- Alint/Swse

32302 Alint-Beg1/Caaq

*Alnus incana* spp. *tenuifolia*-*Betula glandulosa*/*Carex aquatilis* p.a.

Marshy pond margins in subalpine zone, openings in spruce-fir forest.

|                                 |                                                                                             |
|---------------------------------|---------------------------------------------------------------------------------------------|
| a <i>Picea engelmannii</i>      | <i>Alnus incana</i> spp. <i>tenuifolia</i><br><i>Betula glandulosa</i><br><i>Salix</i> spp. |
| <i>Equisetum arvense</i>        | <i>Carex aquatilis</i>                                                                      |
| <i>Oxypolis fendleri</i>        | <i>Phleum commutatum</i>                                                                    |
| <i>Clementsia rhodantha</i>     | <i>Carex</i> spp.                                                                           |
| <i>Coeloglossum viride</i>      | <i>Calamagrostis canadensis</i>                                                             |
| <i>Mertensia ciliata</i>        | <i>Luzula parviflora</i>                                                                    |
| <i>Pedicularis groenlandica</i> |                                                                                             |

- Rocky Mountain NP, 9800 ft. (Haynes and Aird 1981)

32303 Alint-Sadr/Eqar

*Alnus incana* spp. *tenuifolia*-*Salix drummondii*/*Equisetum arvense* p.a.

= Alte/Eqar h.t. (Komarkova 1986)

Along streams, flooded during high water seasons, Haplaquolls, pH 5.7.

|                                                                                                                                                       |                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| a <i>Populus tremuloides</i>                                                                                                                          | <i>Alnus incana</i> spp. <i>tenuifolia</i><br><i>Salix drummondiana</i><br><i>Distegia involucrata</i><br><i>Rosa woodsii</i> |
| <i>Equisetum arvense</i><br><i>Osmorhiza depauperata</i><br><i>Smilacina stellata</i><br><i>Heracleum sphondylium</i><br><i>Geranium richardsonii</i> | <i>Carex aquatilis</i><br><i>Calamagrostis canadensis</i><br><i>Poa</i> spp.                                                  |

- Gunnison NF, 9600 ft. (Komarkova 1986)

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32304
Alint/Swse

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*Alnus incana* spp. *tenuifolia*/Swida sericea p.a.

Streambanks, relatively high and dry, very dense stands, Cryaquolls, pH 7.3.

Alnus incana spp. tenuifolia  
Swida sericea





[illegible]

30104

AMEL-Putr/Rosp

Amelanchier spp.-Purshia tridentata/Roegneria spicata p.a.

Steep to moderately-steep (30-85%) slopes, 7300-8300 ft., moderately-deep cobbly and stony soils, mostly on south- and west-facing slopes. Cryoborolls.

|                                                                                                                             |                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                             | Amelanchier alnifolia<br>Amelanchier utahensis<br>Padus virginiana<br>Purshia tridentata<br>Cercocarpus montanus<br>Symphoricarpos oreophilus<br>Artemisia tridentata ssp. wyomingensis<br>Artemisia frigida<br>Artemisia tridentata spp. vaseyana |
| Eriogonum umbellatum<br>Helianthella uniflora<br>Lupinus spp.<br>Physaria acutifolia<br>Delphinium spp.<br>Castilleja flava | Roegneria spicata<br>Stipa nelsoniana<br>Oryzopsis hymenoides                                                                                                                                                                                      |

- nc Colorado, 7875-8530 ft. (Tiedeman et al. 1986)
- Medicine Bow NF, 7300-8300 ft. (Current 1984)

[illegible]

30101

AMEL/Svorl-Artr

Amelanchier spp./Symphoricarpos oreophilus-Artemisia tridentata p.a.

- = Artrv/Syorl assn. (Bunin 1975)
- = Amal/Agsp h.t. (Terwilliger & Tiedeman 1978)
- = Amal/Artr p.a. (Terwilliger et al. 1979)
- = Artrv/Syorl c.t. (Tweit & Houston 1980)
- = Artrv/Syorl/Agsp h.t. (Hironaka et al. 1983)

Snowdrift accumulation sites on shallow soils, along ridges. Also on deeper, well-developed, moderately well-drained loam soils in higher elevation sagebrush adjacent to oakbrush types, 6000-8600 ft., 0-100% middle to upper slopes, pH 5.5-7.2

|                                                                                                      |                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                      | Amelanchier spp.<br>Symphoricarpos oreophilus<br>Artemisia tridentata ssp. vaseyana<br>Chrysothamnus nauseosus<br>Padus virginiana<br>Purshia tridentata<br>Cercocarpus montanus<br>Chrysothamnus viscidiflorus |
| Lupinus spp.<br>Eriogonum subalpinum<br>Heliomeris multiflora<br>Delphinium spp.<br>Castilleja flava | Elymus trachycaulus<br>Roegneria spicata<br>Poa compressa<br>Oryzopsis hymenoides<br>Bromus porteri<br>Poa fendleriana<br>Stipa columbiana<br>Carex spp.                                                        |



- ALSO SEE: - Quga-Pavi/Pamy  
- Quga/Syor1

[illegible]

30403

Arar3/Feid

*Artemisia arbuscula*/*Festuca idahoensis* p.a.

Shallow to moderately deep coarse soils, more mesic than Arar3/Agsp.  
6200-9100 ft., not on calcareous substrates.

|                                                                                                                                                                                                                                                |                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                | <i>Artemisia arbuscula</i><br><i>A. tridentata</i> ssp. <i>vaseyana</i><br><i>A. frigida</i>                               |
| <i>Antennaria rosea</i><br><i>Allium cernuum</i><br><i>Phlox hoodii</i><br><i>Erigeron compositus</i><br><i>Phlox longifolia</i><br><i>Eriogonum umbellatum</i><br><i>Senecio</i> sp.<br><i>Balsamorhiza</i> spp.<br><i>Eremogone congesta</i> | <i>Festuca idahoensis</i><br><i>Roegneria spicata</i><br><i>Koeleria macrantha</i><br><i>Carex</i> spp.<br><i>Poa</i> spp. |

- se Oregon, 3000-9000 ft. (Dealy et al. 1981)
- w Montana, 6200-9100 ft. (Mueggler and Stewart 1980)
- Shoshone NF, below 8500 ft. (Tweit and Houston 1980)
- w Wyoming, 6390-7000 ft. (Sabinske and Knight 1978, Beetle 1961)
- Bighorn NF (Terwilliger et al. 1979)
- sw Idaho, 5000-7000 ft. (Hironaka et al. 1983)
- c Idaho, 6000-9800 ft. (Schlatterer 1972)
- n Nevada, 6200-6600 ft. (Zamora and Tueller 1973)
- e Oregon, 4700-5200 ft. (Volland 1976)
- c Oregon, 4700-6500 ft. (Dealy 1971, Buckhouse and Mattison 1980)

Terwilliger et al. (1979) did not distinguish between this and Artr/Feid p.a., since they include Arar<sup>3</sup> and Artr in the same species.

The Nevada community (Zamora and Tueller 1973) also includes *Chrysothamnus viscidiflorus*, *Poa secunda*, *Collinsia parviflora*, *Erigeron bloomeri*, *Agoseris glauca*, *Crepis acuminata*, and *Astragalus purshii*.

[illegible]

30401

**Arar3/Rosp**

*Artemisia arbuscula*/*Roegneria spicata* p.a.



- w Wyoming, 6500-8400 ft. (Youngblood et al. 1985)
- c Idaho, 6000-8000 ft. (Schlatterer 1972)
- Routt NF, 8620-9300 ft. (Terwilliger et al. 1979, Smith 1966)
- Arapaho NF
- Gunnison NF, 9595 ft. (Komarkova 1986)
- Grand Mesa NF
- Medicine Bow NF, 7000-9000 ft.

Pentaphylloides, Pterogonum alatum, and Linum lewisii decrease with use; Artemisia tridentata and A. cana increase.

ALSO SEE: - Pef1/Feid

SSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS

|       |            |
|-------|------------|
| 30203 | Arca3/Feth |
|-------|------------|

Artemisia cana/Festuca thurberi p.a.

Meadows and parks, cold, deep soils, moist subalpine, level to gently sloping (0-15%) low lying terrain, alluvial floodplains, or depressions, pH 6.4-6.8, 8000-9700 ft.

|                                                                                                                                         |                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                         | <i>Artemisia cana</i><br><i>Pentaphylloides floribunda</i><br><i>Chrysothamnus nauseosus</i>                                                                                                                                                        |
| <i>Lathyrus leucanthus</i><br><i>Achillea lanulosa</i><br><i>Vicia americana</i><br><i>Senecio</i> sp.<br><i>Potentilla pulcherrima</i> | <i>Festuca thurberi</i><br><i>Bromus porteri</i><br><i>Danthonia intermedia</i><br><i>Stipa nelsonii</i><br><i>Carex geyeri</i><br><i>Poa fendleriana</i><br><i>Elymus trachycaulus</i><br><i>Festuca idahoensis</i><br><i>Muhlenbergia montana</i> |

- Arapaho NF, 8860-9680 ft. (Terwilliger and Tiedeman 1978, Hess 1981, Wasser and Hess 1982, Tiedeman 1987)
- Routt NF (Terwilliger et al. 1979)
- Gunnison NF, 9450 ft. (Komarkova 1986)

ALSO SEE: - Pef1/Feth

30201 Arca3/E1sm

Artemisia cana/Elytrigia smithii p.a.

$$= \text{Agsp}/\text{Arca3} \text{ h.t. (Terwilliger 1979)}$$

Alluvial flats along watercourses, floodplains, and terraces above streams, silty clay loam or loam soil with moderate salt content, not sodic, good subsoil moisture, pH 7.3-8.2. Ustifluvents.

|                      |                             |
|----------------------|-----------------------------|
|                      | Artemisia cana              |
|                      | Chrysothamnus nauseosus     |
|                      | Symphoricarpos occidentalis |
| Achillea lanulosa    | Elytrigia smithii           |
| Allium sp.           | Stipa viridula              |
| Sphaeralcea coccinea | Bouteloua gracilis          |
| Vicia americana      | Stipa comata                |
|                      | Carex filifolia             |





Deep dune - type sands occurring principally on leeward side of major drainageways.

|                     |                         |
|---------------------|-------------------------|
|                     | Artemisia filifolia     |
|                     | Yucca glauca            |
|                     | Opuntia spp.            |
| Ambrosia spp.       | Andropogon hallii       |
| Eriogonum effusum   | Bouteloua gracilis      |
| Plantago patagonica | Calamovilfa longifolia  |
|                     | Stipa comata            |
|                     | Sporobolus cryptandrus  |
|                     | Schizachyrium scoparium |

- Comanche and Cimarron NG's (Costello 1944, Terwilliger et al. 1979)  
 30302 Arfi/SpعرBogr  
 Artemisia filifolia/Sporobolus cryptandrus-Bouteloua gracilis p.a.

Sandy loams and fine sandy loams, rolling hills, average precipitation 23 in/yr, sandy plains range sites.

|                       |                         |
|-----------------------|-------------------------|
|                       | Artemisia filifolia     |
|                       | Yucca glauca            |
|                       | Gutierrezia sarothrae   |
| Ambrosia psilostachya | Sporobolus cryptandrus  |
| Eriogonum annuum      | Bouteloua gracilis      |
| Sphaeralcea coccinea  | Schizachyrium scoparium |
|                       | Bouteloua curtipendula  |
|                       | Bouteloua hirsuta       |
|                       | Eragrostis trichodes    |

- nw Oklahoma, ca. 2000 ft. (Jones 1963, McIlvain and Shoop 1961)
- Comanche NG (Barrington 1975)
- ne Colorado, 5700-6200 ft. (Bunin 1986)

PHASE: 1. *Bouteloua gracilis* co-subdominant -- Comanche NG  
(Barrington 1975)

[illegible]

## ARTEMISIA LONGILOBA SERIES (318)

31801

Arlo3/Elsm

Artemisia longiloba/Elytrigia smithii p.a.

Soils with well-developed clay pan at about 8 in. deep, supersaturated in early part of growing season due to snowmelt, frost heaving common.

|                      |                       |
|----------------------|-----------------------|
|                      | Artemisia longiloba   |
|                      | Artemisia tridentata  |
| Antennaria sp.       | Elytrigia smithii     |
| Comandra umbellata   | Elytrigia dasystachya |
| Eriogonum umbellatum | Festuca idahoensis    |
| Phlox hoodii         | Koeleria macrantha    |
|                      | Poa cusickii          |
|                      | P. fendleriana        |
|                      | P. secunda            |



- 31701 Arno/Rosp

Shallow soils from sandstone, calcareous, gravel, or granitic parent material; well-drained, moderately permeable, precipitation 8-11 in/yr, alluvial fans, fills, and glaciated surfaces, uplands, pH 6.6-7.9. Torriorthents.

- n Nevada, 6500-7600 ft. (Zamora and Tueller 1973)
- s Idaho (Hironaka et al. 1983)
- Shoshone NF, below 7000 ft. (Tweit and Houston 1980)
- se Wyoming (Thatcher 1959)
- nc Wyoming (Fisser et al. 1979)

- *Arno-Muhlenbergia montana*-*Bouteloua graxilis*, with *Hilaria jamesii* -- nw New Mexico. 7200 ft. (Francis 1986)

|                      |                                      |
|----------------------|--------------------------------------|
|                      | Artemisia tridentata spp. tridentata |
|                      | Atriplex canescens                   |
|                      | Gutierrezia sarothrae                |
| Sphaeralcea coccinea | Bouteloua gracilis                   |
|                      | Muhlenbergia torreyi                 |

- ne New Mexico, 5900-6560 ft. (Holechek and Stephenson 1983)
- nw New Mexico, 6800-7200 ft. (Francis 1986)

ALSO SEE: - Artr/Elsm ph. Bogr  
- Atca-Artr/Elsm  
- Artr/Spocr

Artemisia tridentata/Chrysothamnus nauseosus p.a.

**Eriogonum cernuum**

- Thunder Basin NG (Terwilliger et al. 1979)
- nc Wyoming, 4000-4500 ft. (Olson & Gerhart 1982)

**Artemisia tridentata-Purshia tridentata/Elytrigia dasystachya p.a.**

Antennaria rosea  
Arenaria spp.  
Eriogonum subalpinum

197



- Medicine Bow NF (Terwilliger et al. 1979)

ALSO SEE: - Artr/Elda p.a.

30514 Artr-Putr/Elsm

*Artemisia tridentata*-*Purshia tridentata*/*Elytrigia smithii* p.a.

= High-elevation big sagebrush-bitterbrush/shallow dark brown loams (Tiedeman 1978)

= Mid-elevation big sagebrush/moderately deep loams (Tiedeman 1978)

Shallow to mod. deep dark brown soils, 0-20% s-w-facing upland slopes, dominants usually 18-25 in tall, precip. 13-22 in/yr, pH 6.9-8.3, 6000-8500 ft.

|                                                                                                                                                                                                                               |                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                               | <i>Artemisia tridentata</i> ssp. <i>vaseyana</i><br><i>Purshia tridentata</i><br><i>Chrysothamnus viscidiflorus</i><br><i>Amelanchier utahensis</i><br><i>Tetradymia canescens</i><br><i>Artemisia frigida</i>                           |
| <i>Phlox multiflora</i><br><i>Phlox bryoides</i><br><i>Eriogonum umbellatum</i><br><i>Erigeron subtrineris</i><br><i>Castilleja</i> sp.<br><i>Sphaeralcea coccinea</i><br><i>Trifolium gymnocarpon</i><br><i>Lupinus</i> spp. | <i>Elytrigia smithii</i><br><i>Oryzopsis hymenoides</i><br><i>Poa secunda</i><br><i>Koeleria macrantha</i><br><i>Poa fendleriana</i><br><i>Carex</i> spp.<br><i>Stipa comata</i><br><i>Stipa nelsoniana</i><br><i>Festuca idahoensis</i> |

- nw Colorado, 6000-8500 ft. (Tiedeman 1978)
- White River NF
- Routt NF (Terwilliger and Smith 1978)
- nc Colorado, 8100-8300 ft. (Smith 1966, Terwilliger and Smith 1978)

At lower elevations, *Purshia tridentata* drops out of composition to form an association more like true Artr/Elsm. See Artr/Elsm.

ALSO SEE: - Putr-Artr/Feid

- Atca-Artr/Elsm

30517 Artr/Elsm

*Artemisia tridentata*/*Elytrigia smithii* p.a.

Dissected sideslopes or rough-broken land, with shallow to moderately-deep, slowly-permeable clayey or fine-textured loam soils, 10-30% slopes, 10-12 in/yr precipitation, 4500-5000 ft. Gently sloping convex slopes, pH 6.1-7.8. Haplargids.

|                                                                      |                                                                                                                                                                                                          |
|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                      | <i>Artemisia tridentata</i> ssp. <i>vaseyana</i><br><i>Artemisia tridentata</i> spp. <i>wyomingensis</i><br><i>Chrysothamnus viscidiflorus</i><br><i>Opuntia polyacantha</i><br><i>Artemisia frigida</i> |
| <i>Vicia americana</i><br><i>Selaginella densa</i><br><i>lichens</i> | <i>Elytrigia smithii</i><br><i>Koeleria macrantha</i><br><i>Poa secunda</i>                                                                                                                              |

Elymus trachycaulus  
Bouteloua gracilis  
Carex filifolia  
Stipa comata  
Poa canbyi  
Stipa viridula

- se Idaho (Harniss and West 1974)
- ne Montana (Branson et al. 1970)
- nc Montana (Mackie 1970, Komberc 1976, Knowles 1975)
- w Wyoming (Whysong and Fisser 1970, Fisser et al. 1979)
- nc Colorado, 7820-7550 ft. (Tiedeman et al. 1987)
- Thunder Basin NG, 4500-5000 ft. (USDI 1974, Steward 1984)
- sw Wyoming (Taylor 1975, Severson et al. 1968, Ward 1985)
- sw North Dakota, 2380-2570 ft. (Hansen et al. 1984, Hirsch 1985)
- se Montana, 3230-4000 ft. (Hansen and Hoffman 1986, MacCracken et al. 1983, Sieg et al. 1983)

Tiedeman (1978) describes a different community from nw Colorado, that he calls "Big sagebrush- greasewood bottomlands/deep sandy loams", characterized as Artrw-Save2/ Elsm p.a. ("Artrw/Elsm h.t."), with *Chrysothamnus viscidiflorus* and *Erigeron subtrivialis* also evident. This probably does not exist on a National Forest in this Region; it seems to be closely related to Baker's (1982) Artrw/Elsm. No *Bouteloua gracilis* is present.

Tiedeman et al. (1987) describe an *Artemisia tridentata* ssp. *tridentata*/*Elytrigia smithii* h.t. from nc Colorado on dry alluvial stream terraces and upland swales at 7380-7870 ft. This may exist on a National Forest in this Region.

PHASES: 1. *Muhlenbergia cuspidata* conspicuous on side-slopes and ridges, with less *Bouteloua gracilis* and *Poa secunda*; more *Stipa viridula* -- nc Montana (Knowles 1975).

2. *Bouteloua gracilis* codominant on clay soils with higher pH (7.8-8.2) nitrates, less *Carex filifolia* and more *Stipa comata*, *S. cirridula*, *Sphaeralcea coccinea* --sw North Dakota (Hirsch 1985), nc Wyoming (Fisser et al. 1979; see Artr/Stcol), sw Wyoming (Whysong and Fisser 1970).

ALSO SEE: - Artr-Chvi3/Elsm

- Artr-Putr/Elsm

- Artrt/Elsm on clay loam soils, with blue grama and ring  
muhly from north-central New Mexico (Holechek and Stephenson 1983)

- Artr/Bogr

- Atca-Artr/Elsm

|       |           |
|-------|-----------|
| 30506 | Artr/Feld |
|-------|-----------|

Artemisia tridentata/Festuca idahoensis p.a.

- = Artrr/Feid h.t. (Daubenmire 1970)
- = Artrw/Feid h.t. (Terwilliger & Tiedeman 1978, Tweit & Houston 1980, Schletterer 1972, Lewis 1975, Hironaka et al. 1983)
- = Artrr/Feid(MONT) h.t. (Mueggler & Stewart 1980)
- = Artrw/Feid h.t. (Tweit & Houston 1980)
- = Artrt/Feid h.t. (Hironaka et al. 1983)

Mountain slopes, swales, well-drained bottomlands, moderate snow-accumulation areas, moderately mesic, variety of aspects, mostly se-sw-facing, 0-40% slope, relatively high precipitation, pH 6.4-8.0; 6000-8000 ft. in w Montana, 6000-9500 ft. in nw Wyoming, 7700-9700 ft. in nc Colorado; deep well-drained slowly permeable soils.

|                               |                                                  |
|-------------------------------|--------------------------------------------------|
|                               | <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> |
|                               | <i>A. tridentata</i> ssp. <i>wyomingensis</i>    |
|                               | <i>A. t.</i> ssp. <i>t.</i>                      |
|                               | <i>Chrysothamnus viscidiflorus</i>               |
|                               | <i>A. frigida</i>                                |
| <i>Antennaria rosea</i>       | <i>Festuca idahoensis</i>                        |
| <i>Eriogonum umbellatum</i>   | <i>Poa secunda</i>                               |
| <i>Achillea lanulosa</i>      | <i>Koeleria macrantha</i>                        |
| <i>Potentilla pulcherrima</i> | <i>Poa fendleriana</i>                           |
| <i>Agoseris glauca</i>        | <i>Roegneria spicata</i>                         |
| <i>Erythrocoma triflora</i>   | <i>Stipa</i> spp.                                |
| <i>Vicia americana</i>        | <i>Carex</i> spp.                                |
| <i>Lupinus argenteus</i>      |                                                  |

- A - Washington, 1510-3150 ft. (Daubenmire 1970)  
 - w Montana, 6000-8000 ft. (Mueggler and Stewart 1980, Payne 196X)  
 - c Montana (Jorgensen 1979)  
 - Yellowstone NP, 6500-6900 ft. (Houston 1976)  
 - w Wyoming, 6390-6500 ft. (Sabinske and Knight 1978)  
 - Shoshone NF, 6000-9500 ft. (Terwilliger et al. 1979, Tweit and Houston 1980, Hyde and Beetle 1964)  
 - Bighorn NF (Long & Irwin 1982)  
 - se Oregon, below 7000 ft. (Dealy et al. 1981)  
 - c Oregon (Buckhouse and Mattison 1980)  
 - n Nevada (Lewis 1975)  
 - c Idaho, 6000-7500 ft. (Schlatterer 1972)  
 - s Idaho, 6000-7000 ft. (Hironaka et al. 1983, Hugie et al. 1965)

Includes *Lupinus* spp., *Erythrocoma triflora*, *Leucopoa kingii*, *Eremogone congesta*, *Danthonia intermedia*, *Phlox longifolia*, *Erigeron pumilus*, *Lomatium* spp., *Stipa comata*, *Stipa nelsoniana*, *Opuntia polyacantha*, *Carex eleocharis*, *Carex obtusata*, *C. raynoldsii*, *Muhlenbergia cuspidata*, *Allium* sp.

- B - Routt NF (Terwilliger et al. 1979, Terwilliger & Smith 1978)  
 - Medicine Bow NF  
 - Roosevelt NF, 7800-8700 ft. (Hess 1981)  
 - Arapaho NF, 7700-8700 ft. (Terwilliger and Tiedeman 1978, Strong 1980, Hess 1981, Wasser and Hess 1982, Tiedeman et al. 1987)  
 - nc Colorado, 8580-8610 ft. (Robertson et al. 1966, Smith 1966)  
 - White River NF, 9000-9800 ft. (Hess and Wasser 1982)  
 - Gunnison NF, 9595 ft. (Komarkova 1986)

The Arapaho-Roosevelt NF communities (Terwilliger and Tiedeman 1978, Strong 1980, Hess 1981) include in addition *Symphoricarpos oreophilus*, *Carex heliophila*, *Stipa nelsoniana*, *Castilleja flava*, *Lupinus* sp., *Mertensia lanceolata*, *Phlox bryoides*, *P. multiflora*, and *Sedum lanceolatum*.

The White River NF and Gunnison NF communities (Hess and Wasser 1982, Komarkova 1986) include in addition *Carex geyeri*, *Stipa lettermanii*, *Chrysothamnus vaseyi*, *Poa nervosa*, *Festuca thurberi*,

PHASE: 1. *Geranium viscosissimum* on n-e slopes and deeper soils above 7000 ft., more mesic sites, with greater precipitation and moisture retention -- w Montana (Mueggler and Stewart 1980, Payne 196X), Shoshone NF (Tweit and Houston 1980). Associated species include *Danthonia intermedia*, *Leucopoa kingii*, *Bromus carinatus*, *Elymus trachycaulus*, *Stipa occidentalis*, *Carex raynoldsii*, *Potentilla pulcherrima*, *Drymocallis arguta*, *Helianthella uniflora*, *Eriogonum umbellatum*, and *Fragaria* spp.

30507 Artr/Feth

Exposed low-slopes at lower elevations, steep slopes higher, moderate to steep (5-70%) mountain slopes, often se-sw aspects, a variety of substrates, pH 6.6-7.6, 8800-10500 ft. in n Colorado, 8500-12000 ft. in sc Colorado; deep, well-drained, moderate permeable soils, deep clayey-skeletal horizon.

|                        |                                    |
|------------------------|------------------------------------|
|                        | Artemisia tridentata ssp. vaseyana |
|                        | Symphoricarpos oreophilus          |
|                        | Chrysothamnus viscidiflorus        |
| Eriogonum umbellatum   | Festuca thurberi                   |
| Achillea lanulosa      | Carex geyeri                       |
| Vicia americana        | Koeleria macrantha                 |
| Campanula rotundifolia | Stipa nelsoniana                   |
| Erigeron speciosus     | Bromus porteri                     |
|                        | Elymus trachycaulus                |

- Routt NF (Terwilliger et al. 1979)
- Arapaho NF, 8780-10500 ft. (Giese 1975, Terwilliger and Tiedeman 1978, Hess 1981, Tiedeman et al. 1987)
- White River NF, 9500-10000 ft. (Hess and Wasser 1982, Wasser and Hess 1982)
- Gunnison NF, 8500-10405 ft. (Langenheim 1962, Komarkova 1986)

The Arapaho NF community (Terwilliger and Tiedeman 1978, Hess 1981) has in addition *Rosa woodsii*. The White River NF community (Hess and Wasser 1982) also has *Stipa lettermanii*, *Calochortus gunnisonii*, *Agoseris glauca*, *Geranium viscosissimum*, *Festuca idahoensis*, and *Arabis drummondii*. The Gunnison NF community (Langenheim 1962) has in addition *Eremogone congesta*, *Lathyrus leucanthus*, *Potentilla pulcherrima*, and *Ipomopsis aggregata*.

[illegible]

Artemisia tridentata/Leymus ambiguus p.a.

201



|                           |                                                      |
|---------------------------|------------------------------------------------------|
|                           | <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> |
|                           | <i>Purshia tridentata</i>                            |
|                           | <i>Ribes cereum</i>                                  |
|                           | <i>Opuntia polyacantha</i>                           |
| <i>Senecio fendleri</i>   | <i>Leymus ambiguus</i>                               |
| <i>Drymocallis fissa</i>  | <i>Carex rossii</i>                                  |
| <i>Cryptantha virgata</i> | <i>Elytrigia dasystachya</i>                         |
|                           | <i>Oryzopsis hymenoides</i>                          |

- Roosevelt NF (Hess 1981, Wasser and Hess 1982)

30505 Artr/Leci

*Artemisia tridentata*/*Leymus cinereus* p.a.

= Artrt/Elci h.t. (Terwilliger & Tiedeman 1978, Baker 1982, Doescher et al. 1984)

= Artrv/Elci h.t. (Hironaka et al. 1983)

Upland swales and drainages on moderate s slopes, or at lower elevations on terraces beside streams on level to nearly level terrain, fluvial and alluvial soils, often with lowered water table, pH 6.6-7.6, 7500-8800 ft.

|  |                                                    |
|--|----------------------------------------------------|
|  | <i>Artemisia tridentata</i> ssp. <i>tridentata</i> |
|  | <i>Leymus cinereus</i>                             |

A - Arapaho NF, 7700-8780 ft. (Terwilliger & Tiedeman 1978, Hess 1981, Wasser and Hess 1982)

- sw Wyoming, 7500-8000 ft. (Olson and Gerhart 1982)

- nw Colorado, 6000-7500 ft. (Baker 1982)

This community has in addition:

|                               |                                |
|-------------------------------|--------------------------------|
|                               | <i>Chrysothamnus nauseosus</i> |
|                               | <i>C. viscidiflorus</i>        |
|                               | <i>Rosa woodsii</i>            |
| <i>Erigeron formosissimus</i> | <i>Elymus trachycaulus</i>     |
| <i>Artemisia ludoviciana</i>  | <i>Poa nemoralis</i>           |
| <i>Penstemon caespitosus</i>  | <i>Elytrigia smithii</i>       |

B - se Oregon, 4500-7000 ft. (Dealy et al. 1981, Doescher et al. 1984)

- Shoshone NF

- Idaho (Hironaka et al. 1983)

This community has in addition:

|                            |                          |
|----------------------------|--------------------------|
| <i>Penstemon</i> spp.      | <i>Poa secunda</i>       |
| <i>Erigonum umbellatum</i> | <i>Roegneria spicata</i> |

In Idaho, another association was described for *Artemisia tridentata* ssp. *vaseyana*.

30518 Artr-Syor/Leci

*Artemisia tridentata*-*Symphoricarpos oreophilus*/*Leymus cinereus* p.a.

Near the headwaters of intermittent stream drainages, low to moderate slopes, variety of aspects, moderately deep soils.





Tiedeman (1978) and Terwilliger and Tiedeman (1978) also describe a "low-elevation big sagebrush/shallow gravelly soils", referable to Artr-Chvi3/Elsm p.a. (Artrt/Elsm h.t.), with Atriplex confertifolia, Phlox multiflora, Oryzopsis hymenoides, Stipa comata, Eriogonum lonchophyllum, Machaeranthera grindelioides, and Sphaeralcea coccinea. It is probably not on a National Forest in this Region.

30510

Artemisia tridentata/Oryzopsis hymenoides p.a.

Artr/Orhy

= Low-elevation big sagebrush/moderately deep loams (Tiedeman 1978)

Sagebrush less than 18 in tall, mod. deep loam soils, 0-15% usually s-w facing slopes, precip. 11-16 in/yr, pH 7.5-7.8, 6000-7000 ft.

Artemisia tridentata ssp. wyomingensis  
Chrysothamnus viscidiflorus  
Eurotia lanata

Phlox multiflora  
Sphaeralcea coccinea  
Erigeron subtrinervis  
Phlox longifolia

Oryzopsis hymenoides  
Elytrigia smithii  
Stipa comata

- nw Colorado (Tiedeman 1978, Terwilliger et al. 1979, Baker 1982)
- White River NF?
- Routt NF?

PHASE: 1. Symphoricarpos oreophilus evident or codominant at higher elevations -- nw Colorado, 7500-8000 ft. (Baker 1982)

30502

Artr/Rosp

Artemisia tridentata/Roegneria spicata p.a.

- = Artr-Agsp h.t. (McLean 1970, Daubenmire 1970)
- = Artrw/Agsp h.t. (Terwilliger & Tiedeman 1978, Tweit & Houston 1980, Hironaka et al. 1983, Schlatterer 1972)
- = Agsp/Artr h.t. (Terwilliger 1979)
- = Artr/Agsp(MONT) h.t. (Mueggler & Stewart 1980)
- = Artrt/Agsp h.t. (Tweit & Houston 1980, Hironaka et al. 1983, Lewis 1975)
- = Artrv/Agsp h.t. (Hironaka et al. 1983, Schlatterer 1972, Lewis 1975)

Gravelly slopes, variety of aspects, clay subsoils, mostly e-s-w facing, upper and top of slopes, 5-70%, 7600-9000 ft. with sandy loam-sandy clay loam and pH 6.9-7.9 in nc Colorado; 3300-6000 ft. on loams to sandy loams, and pH 6.6-7.8 in Montana; to 2700 ft. and pH 6.2-8.0 in Washington.

a Juniperus scopulorum

Artemisia tridentata ssp. wyomingensis  
A. tridentata ssp. vaseyana  
A. t. ssp. t.  
Chrysothamnus viscidiflorus  
C. nauseosus  
Artemisia frigida  
Opuntia polyacantha

Phlox spp.  
Lichens  
Psoralea lanceolata

Roegneria spicata  
Poa sp.  
Koeleria macrantha

*Sphaeralcea coccinea*

- A - Washington, 800-2690 ft. (Daubenmire 1971, Rickard 1980-1985)
- British Columbia (McLean 1970, Tisdale 1947)
- w Montana, 4000-6000 ft. (Mueggler and Stewart 1980, Wambolt and Payne 1986)
- se Montana 3340-3680 ft. (Brown 1971, Hansen and Hoffman 1986)
- c Montana (Jorgensen 1979)
- nc Montana (Mackie 1970, Komberec 1976, Knowles 1975-1986)
- n Nevada (Lewis 1975)
- Yellowstone NP, 5200 ft. (Houston 1976)
- c Idaho, 6000-7800 ft. (Schlatterer 1972)
- nc Wyoming, 4350-5250 ft. (Fisser 1964, Fisser et al. 1979)
- s Idaho (Hironaka et al. 1983, Harniss and West 1974)
- Shoshone NF, 4000-6000 ft. (Terwilliger et al. 1979, Tweit and Houston 1980)
- w Utah (Fautin 1946, West et al. 1984)
- Thunder Basin NG
- ne Wyoming (Terwilliger 1979, Joyce 1981)

Precipitation 10-18 in/yr. This community includes, in addition, *Gutierrezia sarothrae*, *Carex eleocharis*, *Carex filifolia*, *Stipa comata*, *Elytrigia smithii*, *Stipa viridula*, *S. thurberiana*, *Poa secunda*, *Allium cernuum*, *Erigeron caespitosus*, *E. compositus*, *Phlox hoodii*, *P. longifolia*, *Leucopoa kingii*, and *Comandra umbellata*. Ssp. *tridentata* is dominant in Washington. Tweet and Houston (1980) and Hironaka et al. (1983) describe three different associations, for *Artemisia tridentata* spp. *wyomingensis*, spp. *tridentata*, and spp. *vasevana*.

- B - Roosevelt NF, 8200-9000 ft. (Hess 1981, Wasser and Hess 1982)  
 - nc Colorado, 7600-8310 ft. (Terwilliger and Tiedeman 1978, Strong 1980, Smith 1966, Tiedeman et al. 1987)  
 - Medicine Bow NF, 7800-7900 ft. (Current 1984)  
 - Arapaho NF  
 - Routt NF (Terwilliger and Smith 1978)  
 - sw Wyoming, 7900 ft. (Marquiss and Lang)  
 - w Wyoming (Beetle 1961)

This community has more *Phlox bryoides*, *Elytrigia dasystachya*, *Elymus trachycaulus*, *Artemisia frigida*, lichens, *Astragalus convallarius*, *Purshia tridentata*, *Ribes cereum*, *Symphoricarpos oreophilus*, *Carex heliophila*, *Poa fendleriana* and *P. secunda*, *Stipa nelsoniana*, *Castilleja* spp., *Eriogonum* spp., *Penstemon secundiflorus*, *Penstemon caespitosus*, *Potentilla hippiana*, *Balsamorhiza sagittata*, *Arenaria hookeri*, and *Erigeron eatonii*.

ALSO SEE: - Atco-Artr/Rosp  
- Putr-Artr/Rosp

30519 Artr/Spcr

- *Artemisia tridentata* / *Sporobolus cryptandrus* p.a.

Alluvial flats, shallow soils, Torriorthents, pH 8.0.



—

|                      |                       |
|----------------------|-----------------------|
| Mertensia lanceolata | Purshia tridentata    |
| Achillea lanulosa    | Carex rossii          |
| Astragalus spp.      | Elytrigia dasystachya |
| Erigonum umbellatum  |                       |
| Dryocallis fissa     |                       |

C - nw Colorado, 6200-6800 ft. (Baker 1982)

Openings in pinyon-juniper and along sandy draws, with codominant *Poa fendleriana*, and no *Bouteloua gracilis*.

D - sw Utah, 7000-7800 ft. (Medany and West)

With conspicuous *Chrysothamnus viscidiflorus* and *Symphoricarpos oreophilus*.

|       |           |
|-------|-----------|
| 30511 | Artr/Stne |
|-------|-----------|

Artemisia tridentata/Stipa nelsoniana p.a.

= *Artrw/Stipa columbiana* h.t. (Terwilliger & Tiedeman 1978, Terwilliger et al. 1979, Tiedeman et al. 1987)

One of the higher *Artemisia tridentata* sites. Soils usually with cracked-polygonal surface, often derived from Pierre shale, 0-20% slopes, variety of aspects, 7600-8700 ft., pH 7.0-7.8.

|                |                                        |
|----------------|----------------------------------------|
|                | Artemisia tridentata ssp. wyomingensis |
|                | Chrysothamnus viscidiflorus            |
| Eriogonum spp. | Stipa nelsoniana                       |
|                | Sitanion hystrix                       |
|                | Poa spp.                               |
|                | Carex spp.                             |

A - Arapaho NF, 7600-8700 ft. (Giese 1975, Terwilliger and Tiedeman 1978, Terwilliger et al. 1979, Tiedeman et al. 1987)

- Routt NF (Terwilliger & Smith 1978)

- nc Colorado, 8080-8370 ft. (Smith 1966)

|                       |                    |
|-----------------------|--------------------|
| Eriogonum umbellatum  | Elytrigia smithii  |
| Penstemon caespitosus | Koeleria macrantha |
| Phlox bryoides        | Poa fendleriana    |
|                       | Poa secunda        |

B - c Oregon, 4800-7000 ft. (Volland 1976, Dealy 1971)

|                       |                  |
|-----------------------|------------------|
| Eriogonum microthecum | Carex rossii     |
| Lathyrus spp.         | Poa nervosa      |
| Achillea lanulosa     | Bromus carinatus |
| Senecio spp.          | Melica bulbosa   |
| Viola purpurea        |                  |



30601

Artemisia tripartita/Festuca idahoensis p.a.

|  |                             |
|--|-----------------------------|
|  | Artemisia tripartita        |
|  | Chrysothamnus viscidiflorus |
|  | Artemisia frigida           |
|  | Tetradymia canescens        |
|  | Chrysothamnus nauseosus     |

*Festuca idahoensis*  
*Koeleria macrantha*  
*Roegneria spicata*  
*Carex eleocharis*  
*Poa fendleriana*  
*P. secunda*

|       |            |
|-------|------------|
| 30603 | Artrl/Pose |
|-------|------------|

Artrl/Pose

Artemisia tripartita/Poa secunda p.a.

Mountain slopes, 6000-8000 ft. on shallow, rocky, loam to sandy loam soils, pH slightly acid to slightly basic; highly permeable; mostly north slopes at low elevations.

|                                                                                                                                     |                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                     | <i>Artemisia tripartita</i><br><i>Chrysothamnus viscidiflorus</i><br><i>Artemisia tridentata</i><br><i>Amelanchier alnifolia</i>                                                      |
| <i>Phlox hoodii</i><br><i>Astragalus miser</i><br><i>Eremogone congesta</i><br><i>Balsamorhiza incana</i><br><i>Antennaria</i> spp. | <i>Poa secunda</i><br><i>Roegneria spicata</i><br><i>Elytrigia smithii</i><br><i>Koeleria macrantha</i><br><i>Festuca idahoensis</i><br><i>Carex rossii</i><br><i>Poa fendleriana</i> |

30604 Artr1/Stc1

Slopes and rolling uplands on shallow, rocky, sandy loam soil, pH slightly acid to slightly alkaline.

- Medicine Bow NF, 7940 ft. (Terwilliger et al. 1979. Boutton et al. 1980)
- Washington, 1740-1820 ft. (Daubenmire 1972)
- se Idaho (Hironaka et al. 1983)

ATRIPLEX SPP. SERIES (324)

Low slopes, deep soils (60+ in), pH 8.2-8.7, precipitation ca. 12 in/yr.

- Comanche NG, ca. 4500 ft.

Also see a very different Bogr/Atca at higher elevations on steep slopes.

ALSO SEE: - Atca/Stcol

- Atca/Spai

[illegible]

Atriplex canescens/Elytrigia smithii-Bouteloua gracilis p.a.

Bottom floodplain, alluvial fine textured soils.

|                      |                                      |
|----------------------|--------------------------------------|
|                      | Atriplex canescens<br>Eurotia lanata |
| Allium textile       | Elytrigia smithii                    |
| Gaura coccinea       | Bouteloua gracilis                   |
| Sphaeralcea coccinea | Carex eleocharis                     |
| Ratibida columnifera | Sporobolus airoides                  |
| Astragalus spp.      | Stipa spp.                           |

- Pawnee NG, 5000 ft.

[illegible]
$$- 32406$$

Atca-Artr/Elsm

*Atriplex canescens*-*Artemisia tridentata*/*Elytrigia smithii* p.a.

= Artr-Atco h.t., in part (Hirsch 1985)

Rough broken land in badlands, sedimentary substrates with outcrops of bentonite clay silty clay loams, pH 6.2-6.6, low organic content (0.8-1.1%), saline surface layers and less so in subsurface.

|                                                                   |                                                                                     |
|-------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                                   | Atriplex canescens<br>Artemisia tridentata spp. wyomingensis<br>Opuntia polyacantha |
| Drymocallis arguta<br>Chenopodium disiccatum<br>Atriplex argentea | Elytrigia smithii<br>Schedonnardus paniculatus                                      |

- sw North Dakota (Hirsch 1985)

ALSO SEE: - Artr/Bogr

- Artr/Elsm

- Atca/Elsm-Bogr

[illegible]

32404

Atca/Stco1

Atriplex canescens/Stipa comata p.a.

Upper slopes and sides of mesas, foothills; southerly slopes, relatively steep.

|  |                    |
|--|--------------------|
|  | Atriplex canescens |
|  | Yucca glauca       |
|  | Eurotia lanata     |
|  | Artemisia frigida  |
|  | Stipa comata       |
|  | Bouteloua gracilis |
|  | Elymus elymoides   |

- Rio Grande NF, 8800 ft.

32403 Atco-Artr/Rosp

= *Atco/Agropyron spicatum* spp. inerme-Orhy h.t. (Baker 1982)

|                      |                                        |
|----------------------|----------------------------------------|
|                      | Atriplex confertifolia                 |
|                      | Artemisia tridentata ssp. wyomingensis |
|                      | Eriogonum sp.                          |
|                      | <u>Artemisia frigida</u>               |
| Phlox caespitosa     | Roegneria spicata                      |
| Sphaeralcea coccinea |                                        |
| Comandra umbellata   |                                        |

- se Montana (Brown)

## Allium textile

- sw Wyoming, 7500-7600 ft. (Lundberg 1981, Marquiss and Lang 1959)

Comandra umbellata  
Eriogonum lonchophyllum  
Arenaria hookeri

ALSO SEE: - Artrw-Atco/Lesa from nw Colorado, 5500-6200 ft. on moderately-steep slopes (Baker 1982). *Roegneria spicata* ssp. *inermis* is present. Also from sw Wyoming (Lundberg 1981).

- Atco/Lesa from nw Colorado, 6200-7200 ft. on steep nw-facing slopes (Baker 1982). *Roegneria spicata* ssp. *inermis* may be present. *Sarcobatus* is not present. Also from sw Wyoming (Lundberg 1981).

- Save2/Rosp

32402 Atca-Atco/Spai

Atriplex canescens-Atriplex confertifolia/Sporobolus airoides p.a.

Alluvial flats with low slope angle, deep soils (>60 in), highly alkaline (pH 8.6-9.0), precipitation ca. 12 in/yr.

Atriplex canescens  
Atriplex confertifolia  
Sarcobatus vermiculatus  
Opuntia polyacantha

|                      |                              |
|----------------------|------------------------------|
|                      | <u>Gutierrezia sarothrae</u> |
| Oenopsis foliosa     | Sporobolus airoides          |
| Sphaeralcea coccinea | Bouteloua gracilis           |
|                      | Hilaria jamesii              |
|                      | Hordeum pusillum             |
|                      | Sitanion hystrix             |
|                      | Sporobolus flexuosus         |
|                      | Sporobolus cryptandrus       |

- Comanche NG, ca. 4500 ft.
- nw New Mexico, 5000-6200 ft. (Francis 1986)

32407 Atga/Elsn  
Atriplex gardneri/Elytrigia smithii p.a.

Alluvial salt bottoms and lower slopes, precipitation 5-9 in/yr, derived from shale or sandstone, sometimes gypseous, Natrargids, pH 8.1-9.9.

|                          |                      |
|--------------------------|----------------------|
|                          | Atriplex gardneri    |
|                          | Opuntia polyacantha  |
|                          | Artemisia tridentata |
| Allium textile           | Elytrigia smithii    |
| Machaeranthera canescens | Poa secunda          |
|                          | Elymus elymoides     |

- nc Wyoming (Fisser et al. 1979)

[illegible]

## BETULA GLANDULOSA SERIES (329)

|                                         |            |
|-----------------------------------------|------------|
| 32901                                   | Beg1/Casc2 |
| Betula glandulosa/Carex scopulorum p.a. |            |

Bogs in valley bottoms, marshes, Cryofibrists, pH 6.3.

|                                |                                                  |
|--------------------------------|--------------------------------------------------|
| a <i>Picea engelmannii</i>     | <i>Betula glandulosa</i>                         |
| a <i>Abies lasiocarpa</i>      | <i>Vaccinium cespitosum</i>                      |
|                                | <i>Salix phylicifolia</i> spp. <i>planifolia</i> |
|                                | <i>Salix glauca</i>                              |
| <i>Viola adunca</i>            | <i>Carex scopulorum</i>                          |
| <i>Polemonium pulcherrimum</i> | <i>Calamagrostis canadensis</i>                  |
| <i>Achillea lanulosa</i>       | <i>Agrostis hyemalis</i>                         |
|                                | <i>Luzula parviflora</i>                         |

- Gunnison NF, 10900 ft. (Komarkova 1986)

|       |            |
|-------|------------|
| 32902 | Beg1/Popul |
|-------|------------|

Betula glandulosa/Polemonium pulcherrimum p.a.

Alpine treeline, relatively dry and rocky, poorly developed herbaceous layers, around 20% coarse fragments in profile.

|                            |                             |
|----------------------------|-----------------------------|
| a <i>Abies lasiocarpa</i>  | <i>Betula glandulosa</i>    |
| a <i>Picea engelmannii</i> | <i>Juniperus communis</i>   |
|                            | <i>Salix glauca</i>         |
|                            | <i>Vaccinium cespitosum</i> |



Poa leptocoma  
Festuca brachyphylla  
Carex foenea  
Poa glauca

- Gunnison NF, 11725 ft. (Komarkova 1986)

30701 Cele/Rosp

= Cele/Agropyron spicatum (Hall 1973, Cole 1982, Schlatter 1972, Mueggler and Stewart 1980)

Cercocarpus ledifolius  
Gutierrezia sarothrae  
Artemisia frigida

Roegneria spicata  
Poa secunda  
Koeleria macrantha  
Stipa comata  
Oryzopsis hymenoides  
Carex rossii  
Festuca idahoensis  
C. filifolia



30808 Cemo-Rhart/Ange  
Cercocarpus montanus-Rhus aromatica spp. trilobata/Andropogon gerardii

Rocky gradual slopes, well-drained, dry to moderately moist, stony to cobbly sandy loams, shallow to deep.

|  |                               |
|--|-------------------------------|
|  | Cercocarpus montanus          |
|  | Rhus aromatica spp. trilobata |
|  | Yucca glauca                  |
|  | Andropogon gerardii           |
|  | Poa spp.                      |
|  | Bouteloua gracilis            |
|  | Bouteloua curtipendula        |

- ne Colorado, 5700-6200 ft. (Bunin 1986)

[illegible]

30804

### Cemo-Rhart/Bocu

Cercocarpus montanus-Rhus aromatica/Bouteloua curtipendula p.a.

= Cemo/Agsm p.a. (Larson 1980)

= Cemo/Rhus aromatica h.t. (Steinauer 1984)

= Cemo/Bocu h.t. (Hoffman 1985)

Moderately steep (38-78%) slopes, all aspects, between mixed prairie and montane forest, shallow loam and clay loam soils derived from sandstones and limestones, pH 7.6-7.8

|                                                      |                                                                                                                                                                           |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a <i>Juniperus scopulorum</i>                        | <i>Cercocarpus montanus</i><br><i>Rhus aromatica</i> spp. <i>trilobata</i><br><i>Rosa arkansana</i><br><i>Ribes</i> spp.<br><i>Artemisia frigida</i>                      |
| <i>Hedeoma hispida</i><br><i>Aster oblongifolius</i> | <i>Bouteloua curtipendula</i><br><i>Oryzopsis hymenoides</i><br><i>Aristida longiseta</i><br><i>Elymus elymoides</i><br><i>Oryzopsis micrantha</i><br><i>Stipa comata</i> |

- Black Hills NF, 4150-4900 ft. (Hayward 1928, Larson 1980, MacIntosh 1931, Black Hills NF 1985, Steinauer 1984, Hoffman 1985)

*Bouteloua curtipendula* has high cover in the stands sampled; Steinauer (1984) says it is an increaser with grazing use on these sites.

[illegible]

30801

Cemo/Elda

Cercocarpus montanus/Elytrigia dasystachya p.a.

= Cemo/Agropyron griffithsii h.t. (Hess 1981)

Shallow to moderately-deep loam with some surface small rock and gravel, moderately steep (30-60%) slopes, n aspects, 5700-7220 ft.

|                      |                       |
|----------------------|-----------------------|
|                      | Cercocarpus montanus  |
|                      | Artemisia frigida     |
|                      | Opuntia polyacantha   |
|                      | Ribes cereum          |
| Eriogonum umbellatum | Elytrigia dasystachya |
| Cystopteris fragilis | Bouteloua gracilis    |
| Mertensia lanceolata | Koeleria macrantha    |
| Agoseris glauca      | Stipa comata          |
| Allium textile       | Carex heliophila      |

- ne Colorado

#####

30803

Cemo/Feid

Cercocarpus montanus/Festuca idahoensis p.a.

Higher elevation; shallow, rocky soils on slopes and ridges. More moist sites such as on north slopes.

Antennaria rosea  
Sedum lanceolatum  
Achillea lanulosa  
Chenopodium leptophyllum

Cercocarpus montanus  
Symphoricarpos oreophilus  
Chrysothamnus viscidiflorus

*Festuca idahoensis*  
*Roegneria spicata*  
*Elytrigia smithii*  
*Stipa comata*  
*Leucopoa kingii*  
*Muhlenbergia filiculmis*  
*Carex eleocharis*

- Wyoming (Terwilliger et al. 1979)

30807 Cemo/Mumo1

Cemo/Mumo1

Cercocarpus montanus/Muhlenbergia montana p.a.

Moderate to steep slopes, 25-56% se-sw-facing, 7900-8600 ft. High cover of exposed soil.

Scutellaria brittonii

Cercocarpus montanus  
Yucca glauca  
Rhus aromatica spp. trilobata  
Muhlenbergia montana  
Stipa scribneri  
Bouteloua gracilis

- Pike NF, 7900-8600 ft. (Radloff 1983)

30802 Cemo/Rosa

Cemo/Rosp

Cercocarpus montanus/Roegneria spicata p.a.

Moderately-steep southerly slopes, shallow, rocky soils on south slopes on ridges; more xeric sites at this elevation, 5500-8800 ft.

Cerastium oreophilum  
Chenopodium leptophyllum  
Allium spp.  
Hedeoma drummondii  
Delphinium nuttallianum

Cercocarpus montanus  
Amelanchier spp.  
Roegneria spicata var. inermis  
Oryzopsis hymenoides  
Stipa comata  
Koeleria macrantha  
Elytrigia dasystachya  
Carex eleocharis

- Wyoming (Terwilliger et al. 1979)
- nw Colorado, 7200-8000 ft. (Baker 1982)
- nw Utah, 5500-7600 ft. (Ream 1964)

[illegible]

Cercocarpus montanus/Stipa comata p.a.

Moderate to steep-sloping (20-60%) terrain, mostly s exposures, residuum-colluvium igneous-metamorphic, pH 6.4-6.8, 5700-6800 ft.

|                      |                               |
|----------------------|-------------------------------|
|                      | Cercocarpus montanus          |
|                      | Artemisia frigida             |
|                      | Opuntia polyacantha           |
|                      | Rhus aromatica spp. trilobata |
| Helianthus pumilus   | Stipa comata                  |
| Allium textile       | Bouteloua gracilis            |
| Astragalus spp.      |                               |
| Eriogonum umbellatum |                               |

- Roosevelt NF (Terwilliger et al. 1979, Hess 1981, Wasser and Hess 1982, Roughton 1966)

PHASE: 1. *Rhus aromatica* spp. trilobata codominant on s slopes and ridgetops, with *Oryzopsis hymenoides*, *Roegneria spicata*, and *Stipa nelsoniana*. This phase was identified by Terwilliger et al. (1979) but not mentioned in the later study of Hess (1981).

|       |            |
|-------|------------|
| 30806 | Cemo/Style |
|-------|------------|

Cercocarpus montanus/Stipa lettermanii p.a.

Low elevations; moderately shallow, rocky soils on slopes and ridgetops. More moist locations such as north slopes

|                                |                               |
|--------------------------------|-------------------------------|
|                                | <i>Cercocarpus montanus</i>   |
| <i>Harbouria trachypleura</i>  | <i>Stipa lettermanii</i>      |
| <i>Helianthus</i> spp.         | <i>Oryzopsis hymenoides</i>   |
| <i>Erysimum</i> spp.           | <i>Stipa comata</i>           |
| <i>Tetranneuris acaulis</i>    | <i>Bouteloua curtipendula</i> |
| <i>Oxytropis</i> spp.          | <i>Bouteloua gracilis</i>     |
| <i>Delphinium nuttallianum</i> | <i>Roegneria spicata</i>      |
| <i>Potentilla</i> spp.         | <i>Koeleria macrantha</i>     |
|                                | <i>Aristida fendleriana</i>   |
|                                | <i>Elymus trachycaulus</i>    |

- Colorado (Terwilliger et al. 1979)

[illegible]

## DISTEGIA INVOLUCRATA SERIES (331)

|                                                    |           |
|----------------------------------------------------|-----------|
| 33101                                              | Diin/Caca |
| Distegia involucrata/Calamagrostis canadensis p.a. |           |

Small stands along streams in canyons, relatively dry, deeper soils, with less coarse fraction, pH 7.1.

Distegia involucrata  
Salix drummondiana

**Calamagrostis canadensis**

- ALSO SEE: - Swse/Diin  
- Sadr/Caca

[illegible]

## 31002

Droc/Caru

= Assn. Erar-Droc (Komarkova 1976, Willard 1979)

= *Droc/Arenaria obtusiloba* h.t. (Terwilliger et al. 1979, Hess 1981)

| *Dryas octopetala*

|                        |                      |
|------------------------|----------------------|
| Lloydia serotina       | Carex rupestris      |
| Silene acaulis         | Kobresia myosuroides |
| Lidia biflora          | Carex eleocharis     |
| Selaginella densa      | Festuca brachyphylla |
| Tonestus pygmaeus      | Poa glauca           |
| Eremogone fendleri     | Luzula spicata       |
| Primula angustifolia   | Trisetum spicatum    |
| Draba streptocarpa     | Carex albonigra      |
| Acomastylis rossii     |                      |
| Eritrichium aretioides |                      |
| Paronychia pulvinata   |                      |
| Trifolium dasyphyllum  |                      |

- wc Montana, 9450-9500 ft. (Bamberg and Major 1968)
- White River NF, 11980-12550 ft. (Hess and Wasser 1982, Wasser and Hess 1982)
- Roosevelt NF, 11150-12300 ft. (Komarkova 1976, Marr 1967, Hess 1981, Wasser and Hess 1982)
- Rocky Mountain NP (Kiener 1939, Willard 1979)
- Gunnison NF, 12300-12500 ft. (Komarkova 1986)

PHASE: 1. *Lidia biflora* codominant with *Dryas octopetala*, and less *Carex rupestris*; more neutral soils (pH 6.4-7.2) -- White River NF (Hess and Wasser 1982), wc Montana (Bamberg and Major 1968). In Montana, *Lupinus sericeus*, *Oxytropis sericea*, and *Phlox pulvinata* are common; there is less *Silene acaulis*.

ALSO SEE: - *Dryas integrefolia*/*Carex rupestris* from central Montana at 8350-8650 ft. (Bamberg and Major 1968). Except for the different dominant *Dryas* species, the plant communities are very similar. *Kobresia* and *Festuca brachyphylla* are not present; pH 7.0-8.3; *Bistorta vivipara* is more conspicuous.



- *Dryas integrifolia*/*Carex pseudoscirpoidea* from central Montana at 8500 ft. (Bamberg and Major 1968). Calcareous tundra pH 7.1-8.3; with *Arosaceae* *chamejasme*, *Carex rupestris*, *Bistorta vivipara*, and *Lloydia serotina*.

31003 Droc/Saren

Dryas octopetala/Salix reticulata spp. nivalis  
= Droc/Caru h.t., in part (Komarkova 1986)

Active, moving scree slopes, high rock-fragment content of soils, pH 6.0-7.7.

|                                             |                                            |
|---------------------------------------------|--------------------------------------------|
|                                             | <i>Dryas octopetala</i>                    |
| <i>Salix reticulata</i> spp. <i>nivalis</i> | <i>Carex nardina</i> spp. <i>hepburnii</i> |
| <i>Astragalus molybdenus</i>                | <i>Trisetum spicatum</i>                   |
| <i>Lloydia serotina</i>                     | <i>Festuca brachyphylla</i>                |
| <i>Castilleja occidentalis</i>              | <i>Carex rupestris</i>                     |
| <i>Silene acaulis</i>                       | <i>Kobresia myosuroides</i>                |
| <i>Anemonastrum narcissiflorum</i>          |                                            |
| <i>Ligularia holmii</i>                     |                                            |

- Gunnison NF, 11805 ft. (Komarkova 1986)

- nw Montana, 7750-7850 ft. (Bamberg and Major 1968)

ALSO SEE: - SALI/Acro

[illegible]

## EUROTIA LANATA SERIES (335)

|       |                                     |           |
|-------|-------------------------------------|-----------|
| 33501 | Eurotia lanata/Hilaria jamesii p.a. | Eula/Hija |
|-------|-------------------------------------|-----------|

Alluvial flats and mesas, Torriorthents and Camborthids, moderately-deep soils, pH 8.2.

|                      |                        |
|----------------------|------------------------|
|                      | Eurotia lanata         |
|                      | Gutierrezia sarothrae  |
| Sphaeralcea coccinea | Hilaria jamesii        |
|                      | Oryzopsis hymenoides   |
|                      | Sporobolus cryptandrus |
|                      | Sporobolus airoides    |

- nw New Mexico, 5700-6700 ft. (Francis 1986)

- sc Utah (Rasmussen and Brotherson 1986)

[illegible]

## HOLODISCUS DUMOSUS SERIES (333)

|       |                                                                               |           |
|-------|-------------------------------------------------------------------------------|-----------|
| 33301 | Holodiscus dumosus/Festuca thurberi p.a.<br>= Feth/Hodu h.t. (Komarkova 1986) | Hodu/Feth |
|-------|-------------------------------------------------------------------------------|-----------|

Steep (50%) ravines and fine-scrub slopes kept free of trees by avalanches and scree movement, pH 6.3.

Holodiscus dumosus  
Rosa woodsii



Juniperus horizontalis/Carex heliophila p.a.

Steep (50-80%) northerly slopes, sandy loam soils, pH 6.6-6.9.

|                        |                             |
|------------------------|-----------------------------|
|                        | Juniperus horizontalis      |
|                        | Artemisia frigida           |
|                        | Symphoricarpos occidentalis |
|                        | Gutierrezia sarothrae       |
| Thermopsis rhombifolia | Carex heliophila            |
| Campanula rotundifolia | Carex filifolia             |
| Achillea lanulosa      | Elytrigia dasystachya       |
| Galium septentrionale  | Koeleria macrantha          |
| Pulsatilla patens      | Schizachyrium scoparium     |
| Erythrocoma triflora   |                             |
| Oxytropis sericea      |                             |
| Lupinus argenteus      |                             |
| Dalea purpurea         |                             |

- sw North Dakota, 3500-3560 ft. (Hansen and Hoffman 1986)

PHASE: 1. *Roegneria spicata* conspicuous in place of *Elytrigia dasystachya*, lower organic content in soil and lower cation exchange (esp. Ca, K), higher sand fraction sandy loams; no *Pulsatilla patens*, *Galium septentrionale* -- sw North Dakota, 3540 ft. (Hansen and Hoffman 1986)

ALSO SEE: - Juho/Scsc

[illegible]

32501

Juho/Scsc

Juniperus horizontalis/Schizachyrium scoparium p.a.

= Pofr/Ansc h.t. (Hirsch 1985) -- see phase Pefl

Steep (20-48%) upper nw-ne slopes, shallow sandy loam to clay loam to silt loam soils, pH 6.2-8.6. 0-30% coarse, scoria buttes.

|                        |                                                                                                                      |
|------------------------|----------------------------------------------------------------------------------------------------------------------|
|                        | Juniperus horizontalis<br>Pentaphylloides floribunda<br>Symphoricarpos occidentalis<br>Rhus aromatica spp. trilobata |
| Helianthus rigidus     | Schizachyrium scoparium                                                                                              |
| Echinacea angustifolia | Calamovilfa longifolia                                                                                               |
| Campanula rotundifolia | Carex heliophila                                                                                                     |
| Dalea purpurea         | Carex filifolia                                                                                                      |
| Senecio plattensis     | Koeleria macrantha                                                                                                   |
| Galium septentrionale  | Elytrigia dasystachya                                                                                                |
| Pulsatilla patens      | Muhlenbergia cuspidata                                                                                               |
| Astragalus gilviflorus |                                                                                                                      |
| Thermopsis rhombifolia |                                                                                                                      |

- sw North Dakota, 2360-2470 ft. (Hansen et al. 1984, Hansen and Hoffman 1986, Hirsch 1985)

PHASE: 1. *Pentaptychoides floribunda* codominant, with more *Padus virginiana* and less *Muhlenbergia cuspidata*, on sandy loam soils with more coarse fraction (28-45%), pH 7.3-8.2, and greater organic matter fraction -- sw North Dakota (Hirsch 1985)

- Juho/Cahe1
- Pif1/Juho
- Stsp/Mucu
- Ansc/STIP

[illegible]

32701 Pavi-Syoc/Els  
Padus virginianiana-Symphoricarpos occidentalis/Elytrigia smithii p.a.

a Juniperus scopulorum

Padus virginiana  
Symphoricarpos occidentalis  
Ribes aureum  
Rhus aromatica spp. trilobata

Smilacina stellata  
Ipomopsis sp.

Elytrigia smithii  
Stipa comata  
Stipa viridula

ALSO SEE: - Syoc/Agsm  
- Frpe/Pavi

[illegible]

32702 Pavi-Syor1/El tr

*Padus virginianus*-*Symphoricarpos oreophilus*/*Elymus trachycaulus* p.a.  
= Pavi/Syor1 h.t. (Komarkova 1986)

Senecio serra  
Osmorhiza depauperata  
Vicia americana

Padus virginianus  
Symphoricarpos oreophilus  
Rosa woodsii  
Elymus trachycaulus  
Poa nemoralis spp. interior  
Poa fendleriana

- Gunnison NF, 9125 ft. (Komarkova 1986)

[illegible]

31105 *Pentaphylloides floribunda*/Ciliaria austromontana p.a. Pefl/Ciau

Ciliaria austromontana  
Trifolium dasyphyllum

Pentaphylloides floribunda  
Ribes montigenum  
Juniperus communis  
Carex arapahoensis  
Elytrigia dasystachya

Aquilegia coerulea  
Oreoxis alpina  
Heuchera parvifolia  
Achillea lanulosa

Trisetum spicatum  
Poa glauca  
Carex eleocharis  
Elymus trachycaulus  
Calamagrostis purpurascens

- Gunnison NF, 11465 ft. (Komarkova 1986)

31104 Pef1/Dece

*Pentaphylloides floribunda*/Deschampsia cespitosa p.a.

= *Potentilla fruticosa*/Dece c.t. (Youngblood et al. 1985)

= *Potentilla fruticosa*/Popr c.t. (Youngblood et al. 1985)

Broad, gently sloping valley bottoms, loamy alluvial soils from sedimentary substrates.

Fragaria virginiana  
Potentilla pulcherrima  
Aster foliaceus  
Dugaldia hoopesii  
Senecio hydrophilus

Pentaphylloides floribunda  
 Artemisia cana  
 Deschampsia cespitosa  
 Carex microptera  
 Poa spp.  
 Carex praegracilis  
 Carex spp.

Most likely this persistent community is seral to Dece/CARE.

- w Wyoming, 6500-8300 ft. (Youngblood et al. 1985, Beetle 1961)

- e Idaho

ALSO SEE: - Dece/CARE

31101 Pef1/Feid

*Pentaphylloides floribunda*/Festuca idahoensis h.t.

= *Potentilla fruticosa*/Feid (Mueggler and Stewart 1980, Tweit and Houston 1980, Youngblood et al. 1985)

Gentle slopes, moderately deep soils of granitic origin, moderately mesic, 20-30 in/yr precipitation, semi-riparian mesic montane meadows.

Achillea lanulosa  
Fragaria virginiana  
Besseyia wyomingensis  
Eremogone congesta  
Campanula rotundifolia  
Potentilla pulcherrima  
Erythrocoma triflora  
Dugaldia hoopesii

Pentaphylloides floribunda  
Artemisia tridentata spp. vaseyana  
Artemisia cana  
Festuca idahoensis  
Danthonia intermedia  
Carex obtusata  
Koeleria macrantha  
Calamagrostis purpurascens  
Carex geyeri  
Agrostis hyemalis

- w Montana, 6500-8600 ft. (Mueggler and Stewart 1980)

- Yellowstone NP

- w Wyoming, 6300-8200 ft. (Youngblood et al. 1985)

- wc Idaho

- Shoshone NF, 6500-8600 ft. (Twitt and Houston 1980)

- Gunnison NF. 9845-10100 ft. (Komarkova 1986)





[illegible]

---

Putr-Artr/Feid

= Artrv/mountain brush (Schlatterer 1972)

*Purshia tridentata*  
*Artemisia tridentata* ssp. *vaseyana*  
*Amelanchier alnifolia*  
*Symphoricarpos oreophilus*

Balsamorhiza sagittata  
Eriogonum umbellatum  
Mertensia lanceolata  
Lupinus spp.  
Comandra umbellata  
Castilleja flava  
Astragalus spp.  
Phlox multiflora

*Festuca idahoensis*  
*Roegneria spicata*  
*Poa fendleriana*  
*Leucopoa kingii*  
*Koeleria macrantha*

- Washington, 1300-3400 ft. (Daubenmire 1972)
- c Oregon, 4500-4700 ft. (Dealy 1971)
- s Idaho, 5200-5300 ft. (Hugie et al. 1965)
- c Idaho, 6000-8000 ft. (Schlatterer 1972)
- n Nevada (Lewis 1975)
- w Montana, above 5000 ft. (Mueggler and Stewart 1980)
- w Wyoming (Beetle 1961)
- Medicine Bow NF (Terwilliger et al. 1979)
- Routt NF
- Arapaho NF, 8000-8900 ft. (Terwilliger and Tiedeman 1978, Tiedeman et al. 1987)
- Shoshone NF, 6000-8500 ft. (Tweit and Houston 1980)
- Gunnison NF, 7890 ft. (Komarkova 1986)

In w Montana, Idaho, Oregon, and Washington, other associates include *Poa secunda*, *Eriogonum congesta*, *Phlox hoodii*, *Lupinus sericeus*, and *Achillea lanulosa*. Shrubs other than *Putr* and *Artr* are not conspicuous. Tweit and Houston (1980) call this the "xeric phase" of this p.a. Terwilliger and Tiedeman (1978) report that *Purshia tridentata* and *Artemisia tridentata* ssp. *vaseyana* are codominant. In nc Colorado, other associates include *Chrysothamnus viscidiflorus*, *Carex* spp., *Oryzopsis hymenoides*, and the forbs listed above.

31202 Putr/Mum01

Putr/Mumol

|                       |                            |
|-----------------------|----------------------------|
|                       | Purshia tridentata         |
|                       | Ribes cereum               |
|                       | Artemisia frigida          |
|                       | Arctostaphylos adenotricha |
| Erigeron umbellatus   | Muhlenbergia montana       |
| Phacelia heterophylla | Muhlenbergia filiculmis    |
| Dryas octopetala      | Leymus ambiguus            |
| Lesquerella montana   | Carex rossii               |
| Artemisia ludoviciana | Leucopoa kingii            |
| Cryptantha virgata    |                            |
| Cystopteris fragilis  |                            |
| Penstemon virens      |                            |

31204 Putr/Roso

Putr/Rosp

|                        |                       |
|------------------------|-----------------------|
|                        | Purshia tridentata    |
|                        | Amelanchier alnifolia |
| Balsamorhiza sagittata | Roegneria spicata     |
| Eriogonum umbellatum   | Koeleria macrantha    |
| Achillea lanulosa      |                       |
| Heterotheca villosa    |                       |

- Shoshone NF, 7500-7700 ft. (Twit and Houston 1980)

- Putr-Atr/Rosp

Purshia tridentata-Artemisia tridentata/Roegneria spicata p.a.

Purshia tridentata  
Artemisia tridentata spp. vaseyana  
Symphoricarpos oreophilus

|                        |                    |
|------------------------|--------------------|
| Balsamorhiza sagittata | Amelanchier spp.   |
| Heliantheilla uniflora | Roegneria spicata  |
| Aster spp.             | Koeleria macrantha |
| Eriogonum spp.         | Poa spp.           |
|                        | Stipa comata       |
|                        | Carex spp.         |
|                        | Stipa lettermanii  |

- Medicine Bow NF, 7200-8900 ft. (Current 1984, Ward 1985)
- n Utah (Cook and Box 1961)

In Utah, *Roegneria spicata* spp. *inermis* is subdominant.

ALSO SEE: - Putr-Artr/Feid

[illegible]

31203

Putr/Stco1

Purshia tridentata/Stipa comata p.a.

= Putr-Stcol h.t. (Daubenmire 1970)

Moderate to steep slopes, shallow sand to sandy loam, pH 6.4-7.2, colluvium of schist or gneiss, 5900-7700 ft.

|                                                                                                                                                                                                                    |                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                    | <i>Purshia tridentata</i><br><i>Artemisia frigida</i><br><i>Opuntia polyacantha</i><br><i>Rhus aromatica</i> spp. <i>trilobata</i><br><i>Artemisia cana</i> |
| <i>Helianthus pumilus</i><br><i>Scutellaria brittonii</i><br><i>Eriogonum umbellatum</i><br><i>Artemisia ludoviciana</i><br><i>Heterotheca villosa</i><br><i>Phacelia heterophylla</i><br><i>Drymocallis fissa</i> | <i>Stipa comata</i><br><i>Bouteloua gracilis</i><br><i>Elytrigia dasystachya</i><br><i>Muhlenbergia montana</i><br><i>Poa secunda</i>                       |

- Roosevelt NF (Terwilliger et al. 1979, Hess 1981, Wasser and Hess 1982)
- e Washington, 950-1310 ft. (Daubenmire 1972, Rickard and Sauer 1982)
- nw Colorado (Cunningham 1971)
- s Idaho (Hironaka et al. 1983)

[illegible]

## QUERCUS GAMBELII SERIES (313)

31301

Quga/Amal

Quercus gambelii/Amelanchier alnifolia p.a.

- = Quga-Prvi/Amal assn. (Bunin 1975)
- = Oak-Serviceberry assn. (Steinhoff 1978)
- = Oak-Serviceberry-Oregon-grape assn. (Steinhoff 1978)
- = Quga/Syor1/Cagel h.t. (Hess and Wasser 1982)
- = Quga/Syor1/Lale assn., in part (Boyce 1977)

Upper to middle valley sides and mesa tops, gentle to steep (0-70%), deep, coarse to very coarse soils, mostly Cryoborolls and Haploborolls.





ALSO SEE: - Quga/Syorl-AMEL.

31306 Quga/Cahel

Quercus gambelii/Carex heliophila p.a.

Upper slopes and broad ridges, savanna alternating with grassland.

|                     |                         |
|---------------------|-------------------------|
|                     | Quercus gambelii        |
|                     | Rosa sp.                |
|                     | Cercocarpus montanus    |
| Heterotheca villosa | Carex heliophila        |
| Artemisia frigida   | Bouteloua gracilis      |
| Astragalus sp.      | Calamovilfa longifolia  |
|                     | Schizachyrium scoparium |
|                     | Muhlenbergia montana    |
|                     | Stipa comata            |

- ec Colorado, 7000 ft. (Livingston 1949)

ALSO SEE: - Quga/Cemo

|       |           |
|-------|-----------|
| 31303 | Quga/Cemo |
|-------|-----------|

Quercus gambelii/Cercocarpus montanus p.a.

|                                |                                  |
|--------------------------------|----------------------------------|
| a <i>Pinus ponderosa</i>       | <i>Quercus gambelii</i>          |
| a <i>Pseudotsuga menziesii</i> | <i>Cercocarpus montanus</i>      |
|                                | <i>Padus virginiana</i>          |
|                                | <i>Ribes cereum</i>              |
|                                | <i>Mahonia repens</i>            |
|                                | <i>Rosa woodsii</i>              |
|                                | <i>Symphoricarpos oreophilus</i> |
| <i>Thermopsis</i> spp.         | <i>Poa pratensis</i>             |
| <i>Vicia americana</i>         | <i>Koeleria macrantha</i>        |
| <i>Castilleja</i> spp.         | <i>Muhlenbergia montana</i>      |
| <i>Iris missouriensis</i>      | <i>Bromus caromatis</i>          |

- San Isabel NF (Terwilliger et al. 1979)
- Rio Grande NF
- San Juan NF

**ALSO SEE:** - Quga/Syor1-AMEL phase Cemo

- Quga/Cahel

31307 Quga-Pavi/Feth

Quercus gambelii-Padus virginianus/Festuca thurberi p.a.

= Quga/Syor1 h. t. (Komarkova 1986)

Moderately-inclined lower slopes and benches, clayey deep well-drained soils, Haplochrepts, pH 6.5.

|                         |                           |
|-------------------------|---------------------------|
|                         | Quercus gambelii          |
|                         | Padus virginianus         |
|                         | Symphoricarpos oreophilus |
|                         | Mahonia repens            |
| Conioselinum scopulorum | Carex geyeri              |
| Lathyrus leucanthus     | Festuca thruberi          |
|                         | Stipa nelsonii            |

- Gunnison NF, 9165 ft. (Komarkova 1986)  
 SSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS  
 31304 Qug-a-Pavi/Pamy  
*Quercus gambelii*-*Padus virginianus*/*Paxistima myrsinites* p.a.

|                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                     | <i>Quercus gambelii</i><br><i>Padus virginiana</i><br><i>Paxistima myrsinites</i><br><i>Rosa woodsii</i><br><i>Symphoricarpos oreophilus</i><br><u><i>Mahonia repens</i></u> |
| <i>Ligusticum porteri</i><br><i>Thalictrum fendleri</i><br><i>Vicia americana</i><br><i>Viola</i> sp.<br><i>Erigeron speciosus</i><br><i>Achillea lanulosa</i><br><i>Lupinus argenteus</i><br><i>Mertensia ciliata</i><br><i>Smilacina stellata</i><br><i>Galium septentrionale</i><br><i>Hydrophyllum fendleri</i><br><i>Heliomeris multiflora</i> | <i>Carex geyseri</i>                                                                                                                                                         |

- PHASE: 3. *Swida sericea* prominent, with *Mahonia repens*, *Amelanchier*, *Acer glabrum*, *Bromus pumpeillianus*, *Osmorhiza depauperata*, and *Streptopov fassettii*. -- Gunnison NF, 6440 ft. (Komarkova 1986)

*Quercus gambelii*/Symphoricarpos oreophilus p.a.  
 = Quga/Syor1/Lale assn. in part (Boyce 1977)  
 = Quga/Cagel h.t. (Henderson et al. 1977)  
 = Mixed mountain shrub-oak/pachic dark brown loams (Tiedeman 1978)  
 = Oak assn. (Steinhoff 1978)  
 = Quga/Syor1 h.t. (Hoffman and Alexander 1980, Hoffman 1982)  
 = Quga/Cagel p.a. (Terwilliger et al. 1979)  
 = Quga-Amut-(Artr-Cemo-Syor1)/Cagel p.a. (Baker 1982) (see phase Cemo)  
 = Quga-Amut-(Prvi-Rowo-Syor1)/Cagel p.a. (Baker 1982)

229



Artemisia dranunculus  
Echinacea angustifolia  
Dalea purpurea  
Phlox andicola  
Astragalus spp.

Stipa comata  
Muhlenbergia cuspidata  
Koeleria macrantha  
Carex heliophila  
Elytrigia dasystachya  
Bouteloua gracilis

- se North Dakota, 3280-3600 ft. (Hansen and Hoffman 1986)

*Carex heliophila* and *Muhlenbergia cuspidata* are notable decreasers with grazing use.

|       |             |
|-------|-------------|
| 31904 | Rhart/Mumol |
|-------|-------------|

*Rhus aromatica* spp. *trilobata*/Muhlenbergia montana p.a.

Steep (100%) rock ledges and screes near rocks, Cryogheats, pH 7.7.

Mertensia lanceolata

Rhus aromatica spp. trilobata  
Artemisia frigida

Muhlenbergia montana  
Festuca arizonica  
Bromus pumpellianus  
Carex geophila  
Elymus elymoides  
Bouteloua gracilis

- Gunnison NF, 9360 ft. (Komarkova 1986)

31901 Bharti/Rosa

*Rhus aromatica* spp. *trilobata*/Roegneria *spicata* p.a.

= Agsp/Poa secunda h.t. phase Rhtr (Terwilliger 1979)

= Rhart/Feid h.t. (Hansen and Hoffman 1986) (see ph. Feid)

Convex shoulders and steep (50-65%) slopes below benches, rocky ridges, shallow rocky arid soils, s-w facing breaks, 4000-5500 ft., substrate entirely porcellinate, pH 7.7-7.9, loams, loamy sand, and sand.

Vicia americana  
Achillea lanulosa  
Cirsium undulatum  
Sphaeralcea coccinea  
Cryptantha spp.

Rhus aromatica spp. trilobata  
Artemisia frigida  
Chrysothamnus nauseosus  
Opuntia polyacantha

Roegneria spicata  
Oryzopsis hymenoides  
Bouteloua gracilis  
B. curtipendula  
Elytrigia smithii

- w Montana, below 4500 ft. (Mueggler and Stewart 1980)

- Shoshone NF, ca. 5500 ft. (Tweit and Houston 1980)

- se Montana (Brown 1971, Hansen and Hoffman 1986)

PHASE: 1. *Festuca idahoensis* present and conspicuous, *Carex heliophila* or *Poa canbyi* may also be conspicuous, *Koeleria macrantha* present, *Sphaeralcea coccinea* absent; slopes more shallow (10-15%) and northerly, at higher elevations, soils more fertile and lower pH (7.0-7.4) -- se Montana, 3960 ft. (Hansen and Hoffman 1986)

Rhus aromatica spp. trilobata/Sporobolus cryptandrus p.a.

- w Oklahoma (Jones 1963)

RIBES SPP. SERIES (320)

Ribes cereum/Festuca idahoensis p.a.

Steep (53%), warm, dry scree slopes of large-sized rock, and rock ledges. Cryothents, pH 7.3.

- Gunnison NF, 9449 ft. (Komarkova 1986)

[illegible]

**Ribes montigenum/Aquilegia coerulea p.a.**

Subalpine rocky slopes, dry and warm, little snow cover in winter, close to treeline, soils an organic horizon resting on scree, high clay content, sw-se-facing 10-70% slopes.

- Arapaho NF, 11320-11500 ft. (Komarkova 1976)

[illegible]

Ribes montigenum/Polemonium pulcherrimum p.a.

Steep scree slopes. Cryorthents. pH 6.9.





31411 Saam-Saphp/Ashe  
Salix amygdaloides-S. phyllcifolia spp. planifolia/Aster hesperius p.a.

|                    |                                    |
|--------------------|------------------------------------|
| a Pinus contorta   | Salix amygdaloides                 |
| a Abies lasiocarpa | Salix phylicifolia spp. planifolia |
| Aster hesperius    | Poa sp.                            |
| Fragaria sp.       |                                    |

31418 Sabol-SALI/Caca

= Sabo/Caca c.t. (Youngblood et al. 1985)

|                            |                                 |
|----------------------------|---------------------------------|
| a <i>Abies lasiocarpa</i>  | <i>Salix boothii</i>            |
| a <i>Picea engelmannii</i> | <i>Salix drummondiana</i>       |
|                            | <i>Salix wolfii</i>             |
|                            | <i>Ribes lacustre</i>           |
|                            | <i>Distegia involucrata</i>     |
| <i>Equisetum arvense</i>   | <i>Calamagrostis canadensis</i> |
| <i>Smilicina stellata</i>  | <i>Carex utriculata</i>         |
| <i>Geum macrophyllum</i>   |                                 |

- w Wyoming

[illegible]

= Sabol/*Carex rostrata* c.t. (Youngblood et al. 1985)

Alluvial soils on gentle benches and terraces adjacent to small streams, and toeslopes, variety of substrates.

|                                                       |                                                                                                                                 |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| a <i>Picea engelmannii</i>                            | <i>Salix boothii</i><br><i>Salix drummondiana</i><br><i>Distegia involucrata</i><br><i>Salix lutea</i><br><i>Ribes lacustre</i> |
| <i>Equisetum arvense</i><br><i>Smilicina stellata</i> | <i>Carex utriculata</i><br><i>Carex aquatilis</i><br><i>Calamagrostis canadensis</i>                                            |

- e Idaho

- *Salix boothii*/*Carex nebrascensis* c.t. from e Idaho (et al. 1985) on seeps and benches adjacent to streams.



31424 Saex-SALI/Caca-Eqar  
Salix exigua-Salix spp./Calamagrostis canadensis-Equisetum arvense p.a.  
= Saex/Eqar c.t. (Youngblood et al. 1985)

Alluvial terraces along major streams or rivers with no recent fluvial deposition, fine-loamy or finer soils, sometimes with high proportions of rock fragments.

|                    |                             |
|--------------------|-----------------------------|
|                    | Salix exigua                |
|                    | Salix boothii               |
|                    | Salix drummondiana          |
|                    | Swida sericea               |
|                    | <u>Distegia involucrata</u> |
| Equisetum arvense  | Calamagrostis canadensis    |
| Geum macrophyllum  | Carex utriculata            |
| Aster occidentalis | Poa palustris               |
|                    | Poa spp.                    |

- w Wyoming, below 7100 ft. (Youngblood et al. 1985)
- e Idaho

ALSO SEE: - Sabo1-SALI/Caca

- *Salix exigua*/*Poa pratensis* c.t. from e Idaho-w Wyoming (Youngblood et al. 1985), along streams and rivers with seasonal flooding, with fewer willows, more *Agrostis* spp., *Poa pratensis*, and *Glyceria striata*.

|       |                                      |               |
|-------|--------------------------------------|---------------|
| 31412 | Salix exigua-Salix spp./Poa sp. p.a. | Saex-SALI/POA |
|-------|--------------------------------------|---------------|

Deciduous shrub riverine-riparian, 12-17 in/yr precipitation, 4000-6500 ft.

|                            |                                    |
|----------------------------|------------------------------------|
| a <i>Populus sargentii</i> | <i>Salix exigua</i>                |
| <i>Acer negundo</i>        | <i>Salix amygdaloides</i>          |
|                            | <i>Salix lutea</i>                 |
|                            | <i>Symphoricarpos occidentalis</i> |
|                            | <i>Rosa spp.</i>                   |
|                            | <i>Poa sp.</i>                     |
|                            | <i>Elytrigia smithii</i>           |
|                            | <i>Carex nebrascensis</i>          |
|                            | <i>Carex spp.</i>                  |

- Medicine Bow NF?
- se Wyoming, 4000-6500 ft. (Olson and Gerhart 1982)
- ne Colorado, below 6000 ft. (Bunin 1986)

31402 Sage-SALI/Caca  
Salix geyeriana-Salix spp./Calamagrostis canadensis p.a.  
= Sage-Sabrl/Caca p.a. (Terwilliger et al. 1979)  
= Sage/Caca h.t. (Hess 1981)  
= Sage/Caca c.t. (Youngblood et al. 1986)

Riverine-riparian, montane, nearly level valley bottoms, sometimes narrow, inundated by early flooding but with low groundwater level during season, moderately well-drained, pH 6.0-6.8, precipitation > 20 in/yr.





- This seems closely related to Sage-SALI/CACA, distinguished by the conspicuous dominance of *Carex utriculata* in the grass layer, and codominance of other *Salix* spp. The Roult NF community is codominated by *Salix lutea*.

Salix geyeriana/Poa palustris p.a.

Broad, flat valley bottoms or benches, fine to clayey soils, moisture near surface throughout growing season.

- e Idaho, below 6700 ft. (Youngblood et al. 1985)

ALSO SEE: - *Salix boothii*/Papa c.t. from e Idaho (Youngblood et al. 1985) on alluvial terraces, with *Salix geyeriana* also present.

- *Salix wolfii*/Papa c.t. from e Idaho (Youngblood et al. 1985) next to small streams, coarse-loamy or fine-loamy soils, with the above species and *Juncus arcticus*, *Polemonium caeruleum*, and *Smilacina stellata*.

Salix glauca/Acomastylis rossii p.a.

= Assn. Bivi-Savi (Komarkova 1976)

Alpine slopes near snowbanks, snow covered in winter, shrubs usually about 20 dm tall. Cryochrepts, pH avg. 5.1, 11050-11700 ft.

- Roosevelt NF, 11070-11680 ft. (Komarkova 1976)



|       |           |
|-------|-----------|
| 31425 | Salu/Eqar |
|-------|-----------|

Salix lutea/Equisetum arvense p.a.

= *Salix lutea* c.t. (Youngblood et al. 1985)

Small inclusions within *Salix boothii* communities on alluvial terraces.

|                       |                      |
|-----------------------|----------------------|
|                       | Salix lutea          |
|                       | Distegia involucrata |
|                       | Ribes lacustre       |
|                       | Salix drummondiana   |
| Equisetum arvense     |                      |
| Actaea rubra          |                      |
| Aster foliaceus       |                      |
| Geranium richardsonii |                      |
| Micranthes odontoloma |                      |
| Senecio triangularis  |                      |

- e Idaho, below 7000 ft. (Youngblood et al. 1985)

[illegible]

Salix petiolaris/Thelypteris palustris p.a.

Peat soils with a permanent watertable 6 to 12 inches beneath the surface.

|                       |                          |
|-----------------------|--------------------------|
| Thelypteris palustris | Salix petiolaris         |
| Aster sp.             | Calamagrostis canadensis |
| Eupatorium maculatum  | Phragmites communis      |
| Lycopus hispida       | Glyceria grandis         |
| Cicuta douglasii      | Carex lacustris          |

- Nebraska NF (Terwilliger et al. 1979)

- nc Nebraska, 2600-3000 ft. (Tolstead 1942)

ALSO SEE: - Saca6-SALI/Caaq

[illegible]

*Salix phylicifolia* spp. *planifolia*/*Caltha leptosepala* p.a.

Cryoborolls, Cryohemists, and Cryosaprists; wetlands, near level or gently sloping (2-15%), drainages, valley bottoms, depressions and seepages, narrow stream floodplains, lake inlets, poorly drained soils, pH 4.8-7.8, 9400-10900 ft.

|                           |                                    |
|---------------------------|------------------------------------|
|                           | Salix phylicifolia spp. planifolia |
|                           | Salix brachycarpa                  |
| Caltha leptosepala        | Deschampsia cespitosa              |
| Ligusticum porteri        | Poa reflexa                        |
| Delphinium barbeyi        | Carex aquatilis                    |
| Achillea lanulosa         | C. festivella                      |
| Pseudocymopterus montanus | Juncus mertensianus                |

- White River NF, 9430-10830 ft. (Hess and Wasser 1982, Wasser and Hess 1982)

- Gunnison NF, 11645 ft. (Komarkova 1986)

31405 Saphp/Caaq

Saphp/Caaq

Salix phylicifolia spp. planifolia/Carex aquatilis p.a.

Low valley bottoms, depressions of forest openings, narrow streamfloodplains, and steep areas. Inundated early season, poorly drained, water table near surface, pH 5.0-6.6, 8950-10800 ft.

|                          |                                    |
|--------------------------|------------------------------------|
|                          | Salix phylicifolia spp. planifolia |
|                          | Betula glandulosa                  |
| Caltha leptosepala       | Carex aquatilis                    |
| Pedicularis groenlandica | C. utriculata                      |
| Clementsia rhodantha     | Eleocharis quinqueflora            |
| Mertensia ciliata        | Calamagrostis canadensis           |
| Erigeron peregrinus      | Carex spp.                         |
| Senecio triangularis     |                                    |
| Cardamine cordifolia     |                                    |

- nw Wyoming (Terwilliger et al. 1979)
- Bighorn NF, 8500-9500 ft. (Olson and Gerhart 1982)
- ne Utah (Lewis 1970)
- Roosevelt NF, 8940-10830 ft. (Hess 1981, Wasser and Hess 1982, Phillips 1977)
- Arapaho NF
- Gunnison NF, 9300-12040 ft. (Keammerer and Stoecker 1980, Komarkova 1986)
- Pike NF, 11600-12450 ft. (Shepherd 1975, as SALI/CARE)
- Routt NF, 9300-10000 ft.
- Medicine Bow NF (Hanna 1934)

Stands dominated by *Eleocharis* occur in patches surrounded by stands dominated by *Salix planifolia* and *Caltha*. *Carex aquatilis* and *C. utriculata* appear in both patches. Sites with more *Calamagrostis canadensis* are often at earlier seral stages than those with *Carex aquatilis* predominant.

PHASE: 1. *Deschampsia cespitosa* more abundant, in subalpine zone, 9500-11700 ft., wet loamy soil with some gravel, low-lying and poorly drained. Associated species include *Potentilla diversifolia*, *Festuca idahoensis*, *Caltha leptosepala*, *Bistorta bistortoides*, *Pedicularis groenlandica*, and *Clementsia rhodantha* -- Roosevelt NF (Marr 1967), Pike NF (Shepherd 1975), and Routt NF. Also see Sag11-Sab11/Dece.

ALSO SEE: - Alte-Befo/SALI  
 - Caaq/Caut phase Elqu  
 - SALI/Begl c.t. of w Montana (Pfister et al. 1977)  
 - Salix phylicifolia spp. planifolia/Carex utriculata from  
 lower elevations in w Wyoming (Youngblood et al. 1985), with Juncus  
 arcticus and Pedicularis groenlandica.

31406 Saphp/Casc2

**Saphp/Casc2**

Salix phylicifolia spp. planifolia/Carex scopulorum p.a.  
= Assn. Rhodiolo integrifoliae-Sapl (Komarkova 1976)

- Arapaho NF, 11480-12400 ft. (Terwilliger et al. 1979, Hess 1981, Wasser and Hess 1982)
- Roosevelt NF, 11310-11830 ft. (Komarkova 1976, May and Webber 1982)
- San Juan NF (Webber et al. 1976)
- White River NF, 11480-12300 ft. (Hess and Wasser 1982)
- Gunnison NF, 10690-12280 ft. (Komarkova 1986)

31414 Sapnp/Dece

Subalpine, poorly-drained, level to nearly level forest openings and valley bottom, soils remain moist through the growing season, mineral soils, pH 5.2-6.0.

- Shoshone NF (Johnson and Billings 1962)
- Arapaho NF, 9400-11300 ft. (Hess 1981, Wasser and Hess 1982)
- Roosevelt NF

[illegible]

Salix wolfii/Calamagrostis canadensis p.a.



Clayey soils on stream terraces and riparian benches.

|                                |                                 |
|--------------------------------|---------------------------------|
|                                | <i>Salix wolfii</i>             |
| <i>Senecio sphaerocephalus</i> | <i>Calamagrostis canadensis</i> |
|                                | <i>Carex utriculata</i>         |
|                                | <i>Bromus canadensis</i>        |
|                                | <i>Alopecurus alpinus</i>       |

- e Idaho (Youngblood et al. 1985)

ALSO SEE: - Sage-SALI/Caca  
- Sabo-SALI/Caca

[illegible]

Salix wolfii/Carex aquatilis p.a.

Alluvial terraces, broad wet meadows, and seeps along toeslopes, mostly derived from sedimentary substrates, thick organic surface horizon.

|                      |                       |
|----------------------|-----------------------|
|                      | Salix wolfii          |
|                      | Betula glandulosa     |
| Polemonium caeruleum | Carex aquatilis       |
| Fragaria virginiana  | Carex utriculata      |
| Aster foliaceus      | Carex lanuginosa      |
| Swertia perennis     | Deschampsia cespitosa |
| Caltha leptosepala   |                       |

- w Wyoming, 6400-8300 ft. (Youngblood et al. 1985, Beetle 1961-1974)  
- e Idaho

**ALSO SEE:** - Saphp/Caaq  
- Sawo/Caut

31420 Sawo/Caut

**Salix wolfii/Carex utriculata p.a.**

= Sawo/*Carex rostrata* c.t. (Youngblood et al. 1985)

Wet alluvial terraces, broad meadows, and large seeps, soils derived from sandstones, with organic surface horizon.

|                      |                   |
|----------------------|-------------------|
|                      | Salix wolfii      |
|                      | Salix boothii     |
|                      | Betula glandulosa |
| Aster foliaceus      | Carex utriculata  |
| Polemonium caeruleum | Carex aquatilis   |
| Fragaria virginiana  | Carex microptera  |
| Equisetum arvense    |                   |

- w Wyoming, 6600-8600 ft. (Youngblood et al. 1985)

31422 Sawo/Dece

*Salix wolfii*/Deschampsia cespitosa p.a.

Lower toeslopes and benches near low-gradient streams, coarse to fine-loamy soils.

|                     |                            |
|---------------------|----------------------------|
|                     | Salix wolfii               |
|                     | Salix brachycarpa          |
|                     | Pentaphylloides floribunda |
| Aster foliaceus     | Deschampsia cespitosa      |
| Fragaria virginiana | Carex utriculata           |
| Geum macrophyllum   | Carex aquatilis            |
| Viola adunca        | Calamagrostis canadensis   |
| Galium spp.         |                            |

- Rocky Mountain NP, 9400 ft. (Bierly 1972)
- w Wyoming (Youngblood et al. 1985)

ALSO SEE: - Saphp/Dece

- Sage-SALI/Caca ph. Dece

- *Salix wolfii*/*Carex nebrascensis* c.t. on toeslopes and benches in w Wyoming and e Idaho (Youngblood et al. 1985), with *Betula glandulosa*, *Carex nebrascensis*, *Carex simulata*, and *Deschampsia cespitosa*.

31423 Sawo/Ervi

Salix wolfii/Fragaria virginiana p.a.

= Sawo/mesic forb c.t. (Youngblood et al. 1985)

Benches or flats adjacent to order 1 or 2 streams, Cryoborolls, coarse-loamy to fine-loamy, or loamy-skeletal.

|                                                                                                                                                                                                               |                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| a <i>Picea engelmannii</i>                                                                                                                                                                                    | <i>Salix wolfii</i><br><i>Betula glandulosa</i><br><i>Pentaphylloides floribunda</i><br><i>Salix boothii</i> |
| <i>Fragaria virginiana</i><br><i>Aster foliaceus</i><br><i>Senecio triangularis</i><br><i>Thalictrum fendleri</i><br><i>Geum macrophyllum</i><br><i>Valeriana occidentalis</i><br><i>Polemonium caeruleum</i> | <i>Poa</i> spp.<br><i>Carex lanuginosa</i><br><i>Deschampsia cespitosa</i>                                   |

- w Wyoming, 6200-8600 ft. (Youngblood et al. 1985)
- e Idaho

[illegible]

## SARCOBATUS VERMICULATUS SERIES (315)

31507 Save2-Atco/Eltr  
Sarobatus vermiculatus-Atriplex confertifolia/Elymus trachycaulus p.a.

Steep upland slope with no  $\text{CaCO}_3$  accumulation, pH 6.2-6.5, low organic content (0.2-0.9%).

|  |                                        |
|--|----------------------------------------|
|  | Sarcobatus vermiculatus                |
|  | Atriplex confertifolia                 |
|  | Artemisia tridentata spp. wyomingensis |
|  | Rhus aromatica spp. trilobata          |
|  | Elymus trachycaulus                    |
|  | Distichlis stricta                     |

```

#####
31501                                     Save2-Artr/E1sm

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= Save2/Agsm h.t. (Terwilliger 1979, Terwilliger et al. 1979, Mueggler & Stewart 1980)

Sarcobatus vermiculatus  
Artemisia tridentata ssp. wyomingensis  
Artemisia tridentata ssp. tridentata  
Atriplex confertifolia  
Eriogonum sp.

Elytrigia smithii  
Poa secunda  
Bouteloua gracilis  
Elymus elymoides  
Sporobolus airoides  
Stipa viridula  
Koeleria macrantha

- The community reported by Jorgensen (1979) has large amounts of *Elytrigia dasystachya*; *Distichlis spicata* may be dominant on patches of microhabitat. The nc Colorado community has more *Stipa lettermannii* and *Phlox bryoides*. The nc Montana and sw North Dakota community (Knowles 1975, Hirsch 1985) has more *Muhlenbergia cuspidata*, *Roegneria spicata*, and *Calamovilfa longifolia*. *Chrysothamnus viscidiflorus* and *C. nauseosus* invade this community.

31505 Save2/Leci

245

Low elevations, narrow band along floodplains of rivers and streams, low precipitation, concave toeslopes with better-drained less-saline soils, 3000-7000 ft., silt loams, Torriorthents and Camborthids.

|                      |                             |
|----------------------|-----------------------------|
|                      | Sarcobatus vermiculatus     |
|                      | Chrysothamnus viscidiflorus |
|                      | Atriplex canescens          |
|                      | Chrysothamnus nauseosus     |
| Aster chilensis      | Leymus cinereus             |
| Iva axillaris        | Elytrigia smithii           |
| Sphaeralcea coccinea | Roegneria spicata           |
|                      | Koeleria macrantha          |
|                      | Carex filifolia             |
|                      | Distichlis spicata          |

- w Montana (Mueggler and Stewart 1980)
- Shoshone NF, 3000-5500 ft. (Tweit and Houston 1980)
- nw Colorado, 6000-7000 ft. (Tiedeman 1978)
- se Oregon, 4100-4200 ft. (Copeland and Greene 1982)
- c Nevada (Roundy et al. 1984)

ALSO SEE: - Artr/Leci  
- Artr-Syor1/Leci  
- Atco-Artr/Rosp

|       |                 |
|-------|-----------------|
| 31502 | Save2-Atga/Pose |
|-------|-----------------|

*Sarcobatus vermiculatus*-*Atriplex gardneri*/Poa secunda p.a.  
= Save2/*Atriplex nuttallii* p.a. (Vass & Lang 1938, Terwilliger et al.  
1979)

Normally lowlands or on salty soil. Texture clay loam with high sodium. Soluble salts moderate (2.9 mhos).

|                                                                                                                                                                                          |                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                          | Sarcobatus vermiculatus<br>Atriplex gardneri<br>Opuntia polyacantha<br>Artemisia spinescens<br>Artemisia tridentata |
| Cymopterus montanus<br>Monolepis nuttalliana<br>Kochia sieversiana<br>Allium textile<br>Atriplex patula<br>Phlox longifolia<br>Trifolium spp.<br>Lappula texana<br>Muscineon divaricatum | Poa secunda<br>Elytrigia smithii<br>Elymus elymoides<br>Elytrigia dasystachya<br>Poa fendleriana                    |

- Thunder Basin NG (Terwilliger et al. 1979)
- sw Wyoming (Vass and Lang 1938, Taylor 1975)
- nc Wyoming (Fisser et al. 1979)

Aldous and Shantz (1924), vegetation type 63.

[illegible]

*Sarcobatus vermiculatus*/Roegneria spicata p.a.

|                 |                                        |
|-----------------|----------------------------------------|
|                 | Sarcobatus vermiculatus                |
|                 | Atriplex confertifolia                 |
|                 | Artemisia tridentata spp. wyomingensis |
|                 | Gutierrezia sarothrae                  |
| Suaeda depressa | Roegneria spicata                      |

|                           |                                |
|---------------------------|--------------------------------|
|                           | <i>Sarcobatus vermiculatus</i> |
| <i>Kochia sieversiana</i> | <i>Sporobolus airoides</i>     |
|                           | <i>Distichlis spicata</i>      |

[illegible]

|                                                                                                                                                           |                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
|                                                                                                                                                           | Swida sericea<br>Distegia involucrata<br>Salix drummondiana<br>Ribes inerme |
| Pyrola rotundifolia<br>Heracleum sphondylium<br>Thalictrum fendleri<br>Geranium richardsonii<br>Geum macrophyllum<br>Aster hesperius<br>Equisetum arvense | Calamagrostis canadensis<br>Poa palustris                                   |



- Gunnison NF, 8925 ft. (Komarkova 1986)

32801 Swse/Hesp

Swida sericea/Heracleum sphondylium p.a.

= *Cornus stolonifera*/*Heracleum lanatum* c.t. (Youngblood et al. 1985)

Flat alluvial benches close to high-gradient streams, thick mollic epipedon, loamy texture, cryic temperature.

|                                                                                                           |                                                                                    |
|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
|                                                                                                           | Swida sericea<br>Salix boothii<br>Rosa woodsii<br>Ribes lacustre<br>Crataegus spp. |
| Heracleum sphondylium<br>Galium triflorum<br>Geum macrophyllum<br>Smilicina stellata<br>Mertensia ciliata |                                                                                    |

- e Idaho, below 6600 ft. (Youngblood et al. 1985)

ALSO SEE: - Pipu/Amal-Swse

32803 Swse/Riin

Swida sericea/Ribes inerme p.a.

Coarse scree in canyons, pH 6.6.

|                                                                                                   |                                                                                                                           |
|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| a <i>Picea pungens</i>                                                                            | <i>Swida sericea</i><br><i>Ribes inerme</i><br><i>Physocarpus monogynus</i><br><i>Rosa woodsii</i><br><i>Rubus idaeus</i> |
| <i>Erigeron elongatus</i><br><i>Parietaria pensylvanica</i><br><i>Cryptogramma acrostichoides</i> | <i>Poa nemoralis</i> spp. interior<br><i>Festuca thurberi</i>                                                             |

- Gunnison NF, 8605 ft. (Komarkova 1986)

[illegible]

## SYMPHORICARPOS OCCIDENTALIS SERIES (326)

32601 Syoc/Els  
Symphoricarpos occidentalis/Elytrigia smithii p.a.

Upper slopes and benches, thickets, loam soils, pH 7.4-7.5

|                          |                             |
|--------------------------|-----------------------------|
|                          | Symphoricarpos occidentalis |
|                          | Rosa woodsii                |
| Achillea lanulosa        | Elytrigia smithii           |
| Parietaria pennsylvanica |                             |
| Artemisia ludoviciana    |                             |

- sw North Dakota, 2320-2350 ft. (Hansen et al. 1984)

ALSO SEE: - Pavi-Svoc/Elsm



- Arapaho NF, 11100-11400 (Komarkova 1976)
- Roosevelt NF, 11200-11700
- Gunnison NF, 12325 ft. (Komarkova 1986)

ALSO SEE: - Saren/Vace

[illegible]

## ANDROPOGON GERARDII SERIES (403)

## Ange/Diols

Valleys between igneous outcrops, deep soils.

Dichanthelium oligosanthos var. scribnerianum  
Andropogon gerardii  
Panicum virgatum  
Eleocharis spp.  
Sporobolus spp.  
Hordeum pusillum

[illegible]

Ange/Scsc

Lower parts of slopes, moderately moist grasslands, deep fine-textured soils, sometimes with rock in profile, well-drained, neutral pH to slightly acid. Clay-loam sandy loam, 3-12% s-se aspects, pH 5.5-7.6. 12-20 in. precip. 3700-4100 ft. in se Montana.

Artemisia frigida  
Gutierrezia sarothrae  
Amorpha canescens

Andropogon gerardii

**Schizachyrium scoparium**

**Koeleria macrantha**

**Bouteloua curtipendula**

*Bouteloua gracilis*

Stipa spp.

**Carex heliophila**

- Black Hills NF, 4500 ft. (Pase and Thilenius 1968, Wasser and Hess 1982, MacIntosh 1931, Black Hills NF 1985)
- nc Colorado, 550-6100 ft. (Bunin 1986)

East side of the Black Hills, associated with *Elytrigia smithii*, *Eremogone fendleri*, and *Pterogonum alatum*.

- se Montana, 3700-4100 ft. (Taylor and Holst 1976)

- w North Dakota, 3000-3700 ft. (Hanson and Whitman 1938, Bjugstad 1965)

Lower slopes receiving runoff water or seepage, subsoil of clay loam. Associates include *Carex eleocharis*, *Elytrigia smithii*, *Carex filifolia*, *Calamovilfa*, *Stipa spartea*, *S. viridula*, *Festuca idahoensis*, *Rosa arkansana*, *Rhus aromatica* spp. *trilobata*, and occasional *Symphoricarpos occidentalis*.

- se South Dakota (Beebe and Hoffman 1968)
- c Nebraska (Weaver and Tomanek 1951, Darland and Weaver 1946, Keim et al. 1932, Weaver and Fitzpatrick 1934)
- Comanche and Cimarron NG's (Terwilliger et al. 1979)
- c-w Oklahoma (Jones 1963, Powell et al. 1978, Bruner 1931, Hake et al. 1984, Rice and Pancholy 1972-1973, Booth 1941)
- c Kansas (Towne and Ownesby 1984, Booth 1941)

Rocky soils, allowing for rapid infiltration. Associates include *Panicum virgatum*, *Panicum scribnerianum*, *Stipa spartea*, *Sorghastrum avenaceum*, *Muhlenbergia wrightii*, *M. racemosa*, *Stipa neomexicana*, *Amorpha canescens*, *Dalea purpurea*, *D. candida*, *Astragalus missouriensis*, *A. crassicaulus*, *Psoralea tenuiflora*, *Ambrosia psilostachya*, and *Sporobolus* spp. Earlier seral stages have *Bouteloua gracilis* and *Buchloe dactyloides* dominant, with *Ambrosia psilostachya* and annual grasses. *Sporobolus heterolepis* and *Poa pratensis* may be common at midseral stages.

**ALSO SEE:** - Stsp/Ange and its phase Scsc

[illegible]

Andropogon gerardii/Sorghastrum avenaceum p.a.

Sand-hill valleys, poorly-drained foothill bottoms, and limy uplands. Maximum water tables 0.9-2.3 ft. below surface, minimum 2.9-4.9 ft. below, deep soils, along streams and well drained fresh water lakes. Capillary fringe above watertable is within reach of grass roots. Never flooded. Very few forbs present. Break range site.

|                     |                         |
|---------------------|-------------------------|
| Lotus purshianus    | Amorpha canescens       |
| Solidago mollis     | Andropogon gerardii     |
| Psoralea tenuiflora | Sorghastrum avenaceum   |
|                     | Spartina pectinata      |
|                     | Panicum virgatum        |
|                     | Elytrigia smithii       |
|                     | Muhlenbergia filiformis |
|                     | Bouteloua curtipendula  |
|                     | Carex spp.              |
|                     | Calamagrostis stricta   |
|                     | Sphenopholis obtusata   |

- c Kansas (Miller 1963, Ungar 1964)
- nc Kansas (Forwood and Ownesby 1985, Weaver and Albertson 1944)
- Nebraska NF (Terwilliger et al. 1979)
- nc Nebraska, 2600-3000 ft. (Tolstead 1942, Frolik and Shepherd 1940, Keim et al. 1932)
- e Oklahoma (Bruner 1931)
- nc Colorado, below 5700 ft. (Bunin 1986)
- se Wyoming, 4610 ft. (Boutton et al. 1980)

Earlier seral stages after disturbance may be dominated by *Poa* (pratensis, compressa), *Phleum pratense*, *Elytrigia smithii*, *Agrostis* (alba, exarata, hiemalis), *Bouteloua curtipendula*, *Hordeum jubatum*, *Distichlis spicata*, annual bromes, *Leymus canadensis*, or weedy forbs. The dominant grass species listed above all flower and seed in the fall. After drought, *Andropogon* and *Sorghastrum* are replaced by *Elytrigia smithii*, *Sporobolus asper*, *Bouteloua curtipendula*, *B. gracilis*, and *Buchloe*.



PHASES: 1. *Spartina pectinata*, *Calamagrostis stricta*, and *Carex* spp. more abundant and *Sorghastrum avenaceum* less conspicuous. -- nc Nebraska (Frolík and Shepherd 1940), nc Colorado, 5300-5400 ft. (Bunin 1986), nc Nebraska (Keim et al. 1932), e North Dakota (Ralston and Dix 1966)

2. *Sporobolus airoides* conspicuous with *Andropogon gerardii* and *Spartina pectinata*; *Schizachyrium scoparium* also conspicuous -- se Wyoming 4610 ft. (Boutton et al. 1986)

ALSO SEE: - Spai/Elsm

[illegible]

40303  
Andropogon gerardii/Sporobolus heterolepis p.a.

Lower portions of steep n-e-facing slopes, lower slopes of steep ravines and draws, and depressions, medium-textured surface and coarse subsoils; non-saline non-alkaline water available in lower root zone throughout most of growing season, relatively deep rooting zone. Sandy loam soils, pH 6.8-7.8, low salt content.

|                       |                         |
|-----------------------|-------------------------|
| Monarda fistulosa     | Andropogon gerardii     |
| Galium septentrionale | Sporobolus heterolepis  |
| Helianthus rigidus    | Panicum virgatum        |
| Aster laevis          | Stipa spartea           |
| Aster ptarmicoides    | Carex eleocharis        |
| Pulsatilla patens     | Schizachyrium scoparium |
| Thalictrum venulosum  | Calamovilfa longifolia  |
| Lilium philadelphicum | Koeleria macrantha      |

- sw North Dakota (Whitman 1979)

- sw North Dakota (Whitman 1979)

ANDROPOGON HALLII SERIES (404)

40401 Anha/Calo

40401  
Andropogon hallii/Calamovilfa longifolia p.a.

Gently undulating hills or stabilized dune hills in the sandhills region, or steeper and higher sandhill dunes, 4-40% slopes of variable aspect, 2400-3800 ft., pH 6.4-8.1, choppy sandhills and rolling sands range sites, mostly loamy sands.

|                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                        | <i>Rosa arkansana</i><br><i>Amorpha canescens</i><br><i>Yucca glauca</i><br><i>Prunus besseyi</i>                                                                                                                                                                                                                                     |
| <i>Ambrosia psilostachya</i><br><i>Dalea villosa</i><br><i>Psoralea</i> spp.<br><i>Ipomoea leptophylla</i><br><i>Tradescantia occidentalis</i><br><i>Helianthus petiolaris</i><br><i>Asclepias arenaria</i><br><i>Artemisia ludoviciana</i><br><i>Liatris punctata</i> | <i>Andropogon hallii</i><br><i>Calamovilfa longifolia</i><br><i>Eragrostis trichodes</i><br><i>Bouteloua hirsuta</i><br><i>Sporobolus cryptandrus</i><br><i>Carex heliophila</i><br><i>Carex filifolia</i><br><i>Schizachyrium scoparium</i><br><i>Muhlenbergia pungens</i><br><i>Koeleria macrantha</i><br><i>Bouteloua gracilis</i> |

- Nebraska NF, 2400-3780 ft. (Burzlaff 1960, Wasser and Hess 1982)
- nc Nebraska (Keim et al. 1932, Morrison et al. 1986)
- sc South Dakota (Tolstead 1941)
- ne Colorado, 4500 ft. (Ramaley 1939)
- nc Nebraska, 2600-3000 ft. (Tolstead 1942)
- w Oklahoma (Bruner 1931)
- sw North Dakota (Hirsch 1985)

PHASES: 1. *Stipa comata* abundant, on harder portions of the sandhills, rolling hills, Valentine soils, with hygroscopic coefficient 3.0-3.5%. *Redfieldia flexuosa* and *Muhlenbergia pungens* form successional communities on unstable dunes.

2. *Eragrostis trichodes* codominant on n slopes of highest dunes, choppy sandhills.

3. *Schizachyrium scoparium* and *Stipa comata* conspicuous --  
nc Nebraska (Morrison et al. 1986)

ALSO SEE: - Scsc/Bohi  
- Calo/Spcr

[illegible]

## BOUTELOUA CURTIPENDULA SERIES (406)

40601

**Bocu/Scsc**

*Bouteloua curtipendula*/Schizachyrium scoparium p.a.

Relatively low water content in soils, shallow rocky soils with shattered substratum (rocky breaks) on limestone or other permeable limy material.

|                       |                                  |
|-----------------------|----------------------------------|
|                       | <i>Yucca glauca</i>              |
|                       | <i>Gutierrezia sarothrae</i>     |
| <i>Eriogonum</i> spp. | <i>Bouteloua curtipendula</i>    |
| <i>Dalea purpurea</i> | <i>Schizachyrium scoparium</i>   |
|                       | <i>Bothriochloa saccharoides</i> |
|                       | <i>Andropogon hallii</i>         |
|                       | <i>Panicum virgatum</i>          |
|                       | <i>Bouteloua gracilis</i>        |
|                       | <i>Bouteloua hirsuta</i>         |
|                       | <i>Stipa neomexicana</i>         |
|                       | <i>Sporobolus cryptandrus</i>    |
|                       | <i>Sporobolus asper</i>          |

- c Oklahoma (Penfound 1964)
- Comanche-Cimarron NG's (Terwilliger et al. 1979, Weaver and Albertson 1944)
- e Oklahoma (Bruner 1931)
- sw Kansas (Miller 1963, Weaver and Albertson 1944)
- Badlands NP (Alertson 1953)



PHASE: 1. *Sporobolus airoides* codominant on more alkaline soils (pH 8.0). Distribution on some sites is patchy, with Bogr and Spai occupying alternate, distinct patches. Associated with *Hordeum pusillum* -- Comanche NG.

ALSO SEE: - Hija/Spai  
- Spai/Bogr

[illegible]

Bouteloua gracilis/Buchloe dactyloides p.a.  
= Bogr/Arlo1 p.a. (Terwilliger et al. 1979)

Upland plateaus, low slopes and flats, hard ("tight") thin loam soils with very-slightly permeable subsoil.

|                            |                        |
|----------------------------|------------------------|
|                            | Artemisia frigida      |
|                            | Opuntia polyacantha    |
| Sphaeralcea coccinea       | Bouteloua gracilis     |
| Astragalus spp.            | Buchloe dactyloides    |
| Plantago patagonica        | Aristida longiseta     |
| Psoralea tenuiflora        | Festuca octoflora      |
| Eriogonum effusum          | Carex filifolia        |
| Machaeranthera pinnatifida | Bouteloua curtipendula |

- A - Pawnee NG (Costello 1944, Bonham and Lerwick 1976, Bonham and Hannan 1978, Wooten 1980, Moir and Trlica 1976, McGinnies et al 1983, Senft et al. 1983, Van Haveren 1983, Costello and Turner 1944)
- sw Nebraska (Judd and Jackson 1939)
  - Black Hills NF (MacIntosh 1931)
  - wc Kansas (Ring et al. 1985)
  - Badlands NP (Albertson 1953)

*Elytrigia smithii* is conspicuous in early seral stages, whereas *Buchloe* only comes in later. Also see Buda/Cahel and Bogr/Stcol. Aldous and Shantz' vegetation type 16 (1924). Associates include:

|                              |                        |
|------------------------------|------------------------|
| Picradeniopsis oppositifolia | Stipa comata           |
| Eriogonum effusum            | Carex heliophila       |
| Cryptantha minima            | Carex eleocharis       |
| Aster tanacetifolius         | Elytrigia smithii      |
| Lappula sp.                  | Sporobolus cryptandrus |

- B - c Nebraska (Pool 1914)

Associates include:

|                        |                           |
|------------------------|---------------------------|
| Oxytropis lambertii    | Munroa squarrosa          |
| Astragalus mollissimus | Schedonnardus paniculatus |

- Comanche NG (Terwilliger et al. 1979, Schroeder 1977, Barrington 1975)
- Cimarron NG
- w Oklahoma, e New Mexico (Judd 1974, Jones 1963, Bruner 1931, Osborn and Allan 1984)
- w Kansas (Schumacher and Atkins 1965, Weaver and Albertson 1944, Albertson and Weaver 1944, Hulett and Tomanek 1969)





A late-seral or climax, undisturbed community is known from the Black Hills NF, best described as *Bouteloua gracilis*/*Carex* spp. (the sedge is unidentified). Other species evident are *Koeleria macrantha*, *Stipa comata*, *Elytrigia smithii*, *Opuntia polyacantha*, and *Artemisia frigida*.

ALSO SEE: - Bogr/Elsm  
- Bogr/Cael1

[illegible]

Bouteloua gracilis/Elytrigia smithii p.a.

= Western wheatgrass-grama-sedge type (Hanson & Whitman 1938)

Fine-textured, shallow, sandy loam to clay loam to silty clay, terraced lowlands to uplands, dry droughty sites impermeable subsoil, sometimes with salt in subsoil. Clay loam-loam, 3-10% ne-nw aspects, 12-19 in. precipitation, 3300-4500 ft.

|                                                                                              |                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                              | <i>Artemisia frigida</i><br><i>Opuntia polyacantha</i>                                                                                                                                                           |
| <i>Sphaeralcea coccinea</i><br><i>Picradeniopsis oppositifolia</i><br><i>Astragalus</i> spp. | <i>Bouteloua gracilis</i><br><i>Elytrigia smithii</i><br><i>Carex eleocharis</i><br><i>Carex filifolia</i><br><i>Carex</i> spp.<br><i>Aristida longiseta</i><br><i>Stipa comata</i><br><i>Koeleria macrantha</i> |

- A - s Alberta (Coupland 1950)
- s Saskatchewan
- se Montana, 3300-4100 ft. (Taylor and Holst 1976)
- nw South Dakota (Rauzi et al. 1968)
- w North Dakota, 3000-3700 ft. (Hanson and Whitman 1938, Whitman and Helgeson 1946, Bjugstad 1965)
- South Dakota and Nebraska NG's (Terwilliger et al. 1979)
- Thunder Basin NG (Costello 1944)
- Black Hills NF, 4500 ft. (Pase and Thilenius 1968, Wasser and Hess 1982, Rauzi et al. 1968, Black Hills NF 1985)
- w Nebraska (Rauzi et al. 1968)
- Badlands NP (Albertson 1953)

Clay loams, terraced bottomlands or uplands, sometimes with shallow soil, little sand, or with salty subsoil, pH 7.2-7.5. Associates include *Bouteloua curtipendula*, *Calamagrostis montanensis*, *Elytrigia dasystachya*, *Psoralea agrophylla*, *S. viridula*, *Poa secunda*, *Plantago patagonica*, *Draba nemorosa*, *Phlox hoodii*, *Selaginella densa*, *Atriplex gardneri*, *Artemisia tridentata*, *A. dracunculul*, and *Poa arida*.

- B - Pawnee NG (Terwilliger et al. 1979)  
- se Wyoming, 7660 ft. (Hyder and Houston 1972, Beetle 1952, Samuel and Howard 1982, Griffith et al. 1984, Hart et al. 1983, Rauzi and Fairbourn 1983, Boutton et al. 1980)

Lowland site, with loam surface and sandy permeable subsoil. Argiustolls, clay loams; pH 8.0. Associates include *Carex heliophila*, *Buchloe*, *Distichlis*, *Poa secunda*, *Delphinium geyeri*.

- C - Pawnee NG (Terwilliger et al. 1979, Wooten 1980, Hansen and Gold 1977, Klatt and Hein 1978)
- nc Colorado (Hanson and Dahl 1956, Hanson et al. 1931)
- c Nebraska (Rauzi et al. 1968)

D - Comanche and Cimarron NG's (Schroeder 1977, Barrington 1975)  
- Oklahoma (Bruner 1931)

PHASE: 2. *Buchloe dactyloides* co-dominant at climax on heavy, thick clay soils, with *Achillea lanulosa* -- Badlands NP and Buffalo Gap NG (Albertson 1953); sw North Dakota (Bjugstad 1965)

**Bogr/Eula1**

Slightly inclined landscape on shale parent material.

|               |                      |
|---------------|----------------------|
|               | Eurotia lanata       |
|               | Atriplex gardneri    |
|               | Artemisia tridentata |
|               | Opuntia polyacantha  |
| Psoralea spp. | Bouteloua gracilis   |
|               | Elytrigia smithii    |
|               | Stipa comata         |
|               | Koeleria macrantha   |

[illegible]

Mesas and alluvial flats, Torriorthents, shallow to moderately deep, silty clay loams to loams, pH 8.2-8.8.

Gutierrezia sarothrae  
Opuntia imbricata

|                      |                             |
|----------------------|-----------------------------|
| Sphaeralcea coccinea | a <u>Atriplex canescens</u> |
|                      | Bouteloua gracilis          |
|                      | Hilaria jamesii             |
|                      | Sporobolus airoides         |
|                      | Sporobolus cryptandrus      |
|                      | Muhlenbergia arenicola      |
|                      | Muhlenbergia torreyi        |
|                      | Bouteloua eriopoda          |

- nw New Mexico, 6100-6900 ft. (Francis 1986)

PHASE: 1. *Bouteloua eriopoda* prominent on stony clay loams, with less *Bouteloua gracilis*; *Orthents-Ustolls*; *Stipa neomexicana* and *Zinnia grandiflora* evident -- nw New Mexico, 5700-6400 ft. (Francis 1986)

ALSO SEE: - Hija/Spai  
- Spai/Bogr  
- Bogr/Bocu

40709 Boqr/Mufil

Bouteloua gracilis/Muhlenbergia filiculmis p.a.

Dry prairie and smooth benches, surface mostly litter and bare, flat to gently sloping, mostly s aspects, 8400-9600 ft.

|                               |                                |
|-------------------------------|--------------------------------|
|                               | <i>Chrysothamnus nauseosus</i> |
| <i>Artemisia frigida</i>      | <i>Bouteloua gracilis</i>      |
| <i>Hymenoxys richardsonii</i> | <i>Muhlenbergia filiculmis</i> |
| lichens                       | <i>Carex obtusata</i>          |

- Rio Grande NF (Shepherd 1975)

Aldous and Shantz (1924), vegetation type 5.

PHASES: 1. *Chrysothamnus nauseosus* present, lower bottoms at lower elevations.

2. *Chrysothamnus parryi* present, moderately steep, 27%  
ne-se slopes.

GGCGGCGGGGGGGGGCGCGGGGGGGGGCGCGGGGGGGGGCGCGGGGGGGGGCGCGGGGGGGGGCGCGGGGGGGGGCGCG

40711 Bogr/Stcol

Bouteloua gracilis/Stipa comata p.a.

= Grama-needlegrass-sedge type (Hanson & Whitman 1938)

Upland plateaus and gentle slopes, fine sandy loam to loam, deep soil; carbonate layer at about 30 inches, hygroscopic coefficient 2-6%, pH 5.8-6.7.

|                            |                           |
|----------------------------|---------------------------|
| Sphaeralcea coccinea       | Rosa arkansana            |
| Liatris punctata           | Stipa comata              |
| Gaura coccinea             | Bouteloua gracilis        |
| Selaginella densa          | Carex filifolia           |
| Draba nemorosa             | Elytrigia smithii         |
| Plantago patagonica        | Sporobolus cryptandrus    |
| Machaeranthera pinnatifida | Schedonnardus paniculatus |
| Lygodesmia juncea          | Koeleria macrantha        |
| Leucelene ericoides        | Carex eleocharis          |
|                            | Carex heliophila          |

- ec Colorado, 6500 ft. (McGinnies et al. 1983)
- South Dakota and Nebraska NG's (Terwilliger et al. 1979)
- Thunder Basin NG (Rauzi et al. 1968)
- Alberta (Coupland 1950)
- Saskatchewan
- sc Montana (Wright and Wright 1948)
- se Alberta (Clarke et al. 1943, Clarke et al. 1942)
- sw Saskatchewan
- se South Dakota, 3000-3500 ft. (Tolstead 1941)
- w North Dakota, 2000-2600 ft. (Hanson and Whitman 1938, Joyce 1981, Whitman and Helgeson 1946)
- wc Nebraska, 3600-3800 ft. (Barnes et al. 1984)
- nc Nebraska (Keim et al. 1932)

Aldous and Shantz' vegetation type 12 (1924). In mid-seral condition, these sites are dominated by *Bouteloua gracilis*, *Aristida longiseta*, and *Buchloe dactyloides*, and some *Carex filifolia* varying by site; *Stipa comata* has completely dropped out.

PHASES: 1. *Calamovilfa longifolia* conspicuous on loamy sands with moderately low available moisture, Valentine fine sand -- rolling, more *Bouteloua hirsuta*, *Andropogon hallii* --sc Nebraska (Barnes et al. 1984, Potvin and Harrison 1984)

2. *Carex heliophila* abundant and codominant, with more *Carex filifolia* as well. *Polygala alba* may be conspicuous. -- w North Dakota (Brand 1980, Redmann 1975, Brand and Goetz 1978, Dix 1960)

3. *Stipa viridula* abundant and subdominant, with more *Poa secunda*, on more alkaline soils -- sc Montana (Wright and Wright 1948)

ALSO SEE: - Atca/Stcol

- Calo/Stcol ph. Bogr

[illegible]

*Bouteloua gracilis*/Stipa spp. p.a.

Excessively drained ridges and alluvial terraces, sandy loam-loam soils, upland sites, pH 7.9-8.2.

|                                |                               |
|--------------------------------|-------------------------------|
| a <i>Juniperus osteosperma</i> | <i>Eurotia lanata</i>         |
| a <i>Pinus edulis</i>          | <i>Yucca glauca</i>           |
|                                | <i>Gutierrezia sarothrae</i>  |
| <i>Astragalus</i> spp.         | <i>Bouteloua gracilis</i>     |
| <i>Physaria</i> spp.           | <i>Stipa comata</i>           |
| <i>Eriogonum</i> sp.           | <i>Stipa neomexicana</i>      |
| <i>Evolvulus nuttallianus</i>  | <i>Bouteloua curtipendula</i> |
| <i>Helianthus pumilus</i>      | <i>Aristida fenderiana</i>    |

- San Isabel NF (Terwilliger et al. 1979)

- nc Colorado, 5300-5400 ft. (Moir 1969)

[illegible]

## BUCHLOE DACTYLOIDES SERIES (409)

40902

Buda/CARE

Buchloe dactyloides/Carex spp. p.a.

- Pawnee NG (Terwilliger et al. 1979)
- se Wyoming, 6600 ft. (Beetle 1952)

[illegible]

Small patches on lower slopes, clay uplands or on lower slopes and bottom of swales not subject to overflow, high soluble salts below 30 inches. pH 7.4-7.8.

- South Dakota and Nebraska NG's (Terwilliger et al. 1979)
- w North Dakota, 3000-3700 ft. (Hanson and Whitman 1938)

[illegible]

|                                                |            |
|------------------------------------------------|------------|
| 41001                                          | Caca/Casa2 |
| Calamagrostis canadensis/Carex sartwellii p.a. |            |

Along streams and well drained fresh water lakes. Capillary fringe above water table is within reach of grass roots. May be flooded in spring.

- Nebraska NF (Terwilliger et al. 1979)
- nc Nebraska, 2600-3000 ft. (Tolstead 1942)

**ALSO SEE:** - Sppe/Caca





41104

Calo/Bogr

Calamovilfa longifolia/Bouteloua gracilis p.a.

Dry valleys below sandhills, relatively heavy ("harder") soils, lower slope positions.

|                         |                                              |
|-------------------------|----------------------------------------------|
|                         | <i>Amorpha canescens</i><br><i>Rosa</i> spp. |
| <i>Solidago</i> spp.    | <i>Calamovilfa longifolia</i>                |
| <i>Helianthus</i> spp.  | <i>Bouteloua gracilis</i>                    |
| <i>Eriogonum annuum</i> | <i>Sporobolus cryptandrus</i>                |
|                         | <i>Panicum virgatum</i>                      |
|                         | <i>Elytrigia smithii</i>                     |
|                         | <i>Festuca octoflora</i>                     |
|                         | <i>Bouteloua hirsuta</i>                     |
|                         | <i>Schizachyrium scoparium</i>               |
|                         | <i>Carex</i> spp.                            |

- nc Nebraska (Frolik and Shepherd 1940, Keim et al. 1932)

ALSO SEE: - Calo/Spchr

[illegible]

41105

Calo/Cahel

Calamovilfa longifolia/Carex heliophila p.a.

Small stands on gently rolling (5-15% slope) hills, uplands, sandy to sandy loam soils, well-drained, pH 5.9-7.1.

|                       |                        |
|-----------------------|------------------------|
| Artemisia ludoviciana | Calamovilfa longifolia |
| Psoralea argophylla   | Carex heliophila       |
| Lygodesmia juncea     | Koeleria macrantha     |
|                       | Bouteloua gracilis     |
|                       | Carex filifolia        |
|                       | Stipa comata           |

- nw South Dakota (Hansen and Hoffman 1986, Hirsch 1985)

ALSO SEE: - Calo/Stcol

[illegible]

41103

Calo/Spqr

*Calamovilfa longifolia*/Sporobolus cryptandrus p.a.

Dry valley range site. pH 6.1-8.1

|                                                                 |                                                                                                                                                         |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                 | Amorpha canescens<br>Rosa arkansana<br>Yucca glauca                                                                                                     |
| Helianthus rigidus<br>Ambrosia psilostachya<br>Eriogonum annuum | Calamovilfa longifolia<br>Sporobolus cryptandrus<br>Andropogon hallii<br>Bouteloua hirsuta<br>Muhlenbergia pungens<br>Stipa comata<br>Festuca octoflora |

Bouteloua gracilis  
Schizachyrium scoparium  
Panicum virgatum  
Carex heliophila

- Nebraska NF
- c Nebraska (Burzlaff 1960)
- nc Nebraska (Frolik and Shepherd 1940)

ALSO SEE: - Calo/Bogr

CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC  
41102 Calo/Stcol

Calamovilfa longifolia/Stipa comata p.a.

Sandy ridges and hills, upland with well-drained to very well-drained fine sand to fine sandy loam soil, deep (to 75 inches). Low salt, good moisture all year long, pH 6.1-8.4. Choppy sands range site.

|                     |                        |
|---------------------|------------------------|
|                     | Artemisia frigida      |
|                     | Yucca glauca           |
| Lygodesmia juncea   | Calamovilfa longifolia |
| Psoralea lanceolata | Stipa comata           |
| Liatris punctata    | Carex filifolia        |
| Phlox bryoides      | Carex heliophila       |
| Lathyrus spp.       | Carex eleocharis       |
|                     | Muhlenbergia pungens   |
|                     | Sporobolus cryptandrus |
|                     | Redfieldia flexuosa    |
|                     | Andropogon hallii      |
|                     | Eragrostis trichodes   |
|                     | Bouteloua gracilis     |
|                     | Stipa viridula         |

- Badlands NP (Albertson 1953)
- w North Dakota, 3000-3700 ft. (Hanson and Whitman 1938, Hirsch 1985)
- nc Nebraska (Bragg 1978)
- wc Nebraska, 3600-3800 ft. (Barnes et al. 1984)
- Thunder Basin NG (Twrwilliger 1979)
- ne Colorado (Dahl 1963)
- sw North Dakota (Whitman 1979, Brand 1980)
- e North Dakota (Ralston and Dix 1966)
- s Manitoba

PHASE: 1. Boutelous gracilis more abundant to conspicuous with more Elytrigia smithii, Psoralea tenuiflora, Andropogon hallii, Croton texensis, and Ratibida columnifera; less Carex filifolia. Sandy lowlands, clay loams with moderately high available water -- wc Nebraska, 3600-3800 ft. (Barnes et al. 1984); sw-e North Dakota (Hirsch 1985, Ralston and Dix 1966); ne Colorado (Dahl 1963); Badlands NP (Albertson 1953)

ALSO SEE: - Bogr/Stocl phase Calo  
- Calo/Cahel

CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC

Caag/Cahol

$$= C_{aq}/C_{ca} \text{ h.t. (Komarkova 1986)}$$

Gentle slopes, wet meadows near streams. Cryaquepts, pH 5.6.

|                         |                          |
|-------------------------|--------------------------|
| Conioselinum scopulorum | Carex aquatilis          |
| Epilobium ciliatum      | Carex hoodii             |
| Geum macrophyllum       | Calamagrostis canadensis |
|                         | Deschampsia cespitosa    |
|                         | Poa tracyi               |
|                         | Juncus saximontanus      |

- Gunnison NF. 9920 ft. (Komarkova 1986)

[illegible]

41201

**Caag/Caut**

Carex aquatilis/Carex utriculata p.a.

= Caaq/Carex rostrata h.t. (Hess 1981, Terwilliger et al. 1979)

= *Carex rostrata*/Caaq h.t. (Hess & Wasser 1982)

= *Carex rostrata* c.t. (Youngblood et al. 1985)

= *Carex aquatilis* c.t. (Youngblood et al. 1985) (see phase Caaq)

Nearly level benches, valley bottoms, toeslopes and depressions, adjacent to two-gradient streams or seeps, poorly drained aluvial soils (Mollisols or Entisols; Cryosapristis or Cryohemists); of upper montane and subalpine zones, high water table often at the soil surface, high water capacity, pH 4.0-7.6, 8500-11000 ft.

|                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Caltha leptosepala</i><br><i>Pedicularis groenlandica</i><br><i>Sphagnum</i> spp.<br><i>Dodecatheon pulchellum</i><br><i>Veronica wormskjoldii</i><br><i>Geum macrophyllum</i><br><i>Polemonium caeruleum</i> | <i>Carex aquatilis</i><br><i>Carex utriculata</i><br><i>Deschampsia cespitosa</i><br><i>Carex canescens</i><br><i>Eleocharis quinqueflora</i><br><i>Carex microptera</i><br><i>Scirpus cespitosus</i><br><i>Calamagrostis canadensis</i><br><i>Eriophorum</i> spp.<br><i>Carex festivella</i><br><i>Juncus</i> spp.<br><i>Agrostis</i> spp. |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

- nw Wyoming (Terwilliger et al. 1979)

- w Wyoming, 6000-8600 ft. (Youngblood et al. 1985)

- e Idaho

- ne Utah, 10080-10760 ft. (Lewis 1970, Briggs and MacMahon 1983)

- Medicine Bow NF (Terwilliger et al. 1979, Hanna 1934)

- Roosevelt NF. 9020-10990 ft. (Hess 1981, Wasser and Hess 1982)

- Arapaho NF (Hayes and Aird 1981)

- Rocky Mountain NP, 9400 ft. (Bierly 1972)

- White River NF, 9190-10830 ft. (Hess and Wasser 1982)

- Routt NF, 9500 ft.

- Gunnison NF, 8500-11500 ft. (Langenheim 1962, Keammerer and Stoecker 1980, Komarkova 1986)







[illegible]

Rolling terrain, alpine "grassland" with relatively deep soils with little rock in profile, Cryoborolls and Cryumbrepts, pH 5.9-7.7.

- Gunnison NF, 12360-12460 ft. (Komarkova 1986)

[illegible]

= Cael/Geum rossii p.a. (Hess 1981)

|                        |                   |
|------------------------|-------------------|
| Trifolium dasyphyllum  | Carex elynoides   |
| Acomastylis rossii     | Poa glauca        |
| Eremogone fendleri     | Elymus scribneri  |
| Mertensia viridis      | Trisetum spicatum |
| Lidia biflora          | Carex rupestris   |
| Bistorta bistortoides  |                   |
| B. vivipara            |                   |
| Campanula rotundifolia |                   |
| Selaginella densa      |                   |
| Potentilla pulcherrima |                   |

- Arapaho NF, 11400-12800 ft. (Hess 1981, Wasser and Hess 1982)
- Roosevelt NF
- San Juan NF, ca. 12200 ft. (Webber et al. 1976)
- Gunnison NF, 11820-12780 ft. (Komarkova 1986)

- Komy/Acro-Caru

[illegible]

= Caen/Caoc h.t. (Komarkova 1986)

Late-melting snow patches, Cryorthents, pH 7.8.

|                               |                      |
|-------------------------------|----------------------|
| Salix reticulata ssp. nivalis | Carex engelmannii    |
| Castilleja occidentalis       | Festuca brachyphylla |
| Silene acaulis                | Trisetum spicatum    |
| Besseyia alpina               |                      |
| Potentilla diversifolia       |                      |
| Senecio werneriaefolius       |                      |
| Artemisia scopulorum          |                      |

- Gunnison NF, 12460 ft. (Komarkova 1986)

[illegible]

41210

**Cafo/Acro**

Carex foenea/Acomastylis rossii p.a.

= Assn. Cear-Cafo (Komarkova 1976)

= Cafo/Cear h.t. (Komarkova 1986)

Stabilized fine-talus slopes near treeline, early-melting snow cover, less snow cover than Cael/Oral, variety of aspects (mostly sw-s), 5-35% slopes, pH 5.2-5.8

|                         |                    |
|-------------------------|--------------------|
| Acomastylis rossii      | Carex foenea       |
| Potentilla diversifolia | Trisetum spicatum  |
| Cerastium arvense       | Carex chalciolepis |
| Eremogone fendleri      |                    |
| Artemisia scopulorum    |                    |

- Arapaho NF, 10990-11980 ft. (Komarkova 1976)

- Roosevelt NF

- Gunnison NF, 12120 ft. (Komarkova 1986)

The Gunnison NF community also has *Trifolium parryi*, *Achillea lanulosa*, *Elymus trachycaulus*, and *Festuca idahoensis*.

[illegible]

41211

Caha/Poar2

Carex haydeniana/Poa arctica p.a.

= Assn. Poar2-Caha (Komarkova 1976)

Latest-melting snowpatch areas, small scree and soil movement downward, more disturbed sites at higher elevations, upper alpine zone, pH avg. 5.4-5.5, usually nw- or se-facing 2-30 percent slope, 11350-12050 ft.

|  |                  |
|--|------------------|
|  | Carex haydeniana |
|  | Poa arctica      |
|  | Poa alpina       |

- Roosevelt NF, 11390-12030 ft. (Komarkova 1976)

- Arapaho NF

- Gunnison NF, 12500 ft. (Komarkova 1986)

There are no constant species in this community, other than the dominants cited.

PHASE: 0. *Poa arctica* more predominant, with *Oxyria digyna* --  
Arapaho and Roosevelt NFs (Komarkova 1976)

2. *Potentilla diversifolia* prominent, lower elevations, with more *Deschampsia cespitosa*. *Sibbaldia procumbens*. *Rorippa alpina*.

and *Phleum commutatum*, replacing *Poa arctica* -- Arapaho NF, 11250-11400 ft. (Komarkova 1976); Gunnison NF, 12500 ft. (Komarkova 1986)

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41212 Cami3/Bivi

Marshy depressions, with abundant soil moisture, flat aspects, snow-covered in winter, 11000-11700 ft.

[illegible]

Gently sloping alluvial benches, near small Order 1 streams, variety of soils, commonly Cryaquolls and Cryaquents, high available water capacity.

- w Wyoming, 6300-8600 ft. (Youngblood et al. 1985)
- e Idaho

ALSO SEE: - Caaq/Caut  
- Dece/CARE

Carex nardina/Besseya alpina p.a.  
= Assn. Beal-Cana (Komarkova 1986)

|                         |                              |
|-------------------------|------------------------------|
| Besseyia alpina         | Carex nardina spp. hepburnii |
| mosses                  | Festuca brachyphylla         |
| Erigeron grandiflora    | Poa lettermanii              |
| Silene acaulis          | Festuca minutiflora          |
| Senecio werneriaefolius |                              |
| Chionophila jamesii     |                              |
| Selaginella densa       |                              |

DIS: - Roosevelt NF, 12650-12800 ft. (Komarkova 1976)

- Gunnison NF, 12460 ft. (Komarkova 1986)

[illegible]

41215

Cane/Caag1-Juar

Carex nebrascensis/Catabrosa aquatica-Juncus arcticus p.a.

Along perennial streams below cold springs.

|                       |                           |
|-----------------------|---------------------------|
| Ranunculus cymbalaria | Carex nebrascensis        |
|                       | Catabrosa aquatica        |
|                       | Juncus arcticus ssp. ater |
|                       | Carex microptera          |

- nw Colorado (Baker 1982)

[illegible]

41220

Cane/Dece

Carex nebrascensis/Deschampsia cespitosa p.a.

= Cane c.t. (Youngblood et al. 1985)

Flat or gently-sloping, wide meadows and lower slopes, higher water tables from subirrigation rather than flooding, well-developed soils with deep mollic epipedon, high water holding capability.

|                                 |                              |
|---------------------------------|------------------------------|
|                                 | a <i>Salix geyeriana</i>     |
|                                 | a <i>Salix wolfii</i>        |
| <i>Aster occidentalis</i>       | <i>Carex nebrascensis</i>    |
| <i>Potentilla pulcherrima</i>   | <i>Deschampsia cespitosa</i> |
| <i>Polemonium caeruleum</i>     | <i>Juncus arcticus</i>       |
| <i>Ranunculus alismaefolius</i> | <i>Poa palustris</i>         |
|                                 | <i>Carex lanuginosa</i>      |
|                                 | <i>Carex simulata</i>        |

- Shoshone NF, 7500-8000 ft. (Olson and Gerhart 1982)

- w Wyoming, 6100-7900 ft. (Youngblood et al. 1985)

- e Idaho

ALSO SEE: - Dece/CARE

[illegible]

41213

Can1/JUNC

Carex nigricans/Juncus spp. p.a.

= Assn. Phcol-Cani (Komarkova 1976)

= Can1/Phco1 h. t. (Komarkova 1986)

Low to flat (0-22%) mostly northerly slopes (southerly farther north), alpine depressions near late snowbanks, late melting, snow-free for 3-4 months, peaty soils with well-developed A horizon, sometimes forming peat, pH 4.2-5.1, 10700-11800 ft.

|                          |                      |
|--------------------------|----------------------|
| Veronica wormskjoldii    | Carex nigricans      |
| Erigeron simplex         | Juncus spp.          |
| Oreoxis spp.             | Deschampsia spp.     |
| Pedicularis groenlandica | Phleum commutatum    |
| Sibbaldia procumbens     | Carex illota         |
|                          | Carex hepburnii      |
|                          | Festuca brachyphylla |



- c Idaho, above 8000 ft. (Schlatterer 1972)
- ne Oregon, 7870-8270 ft. (Cole 1982)
- Shoshone NF, 10000-10500 ft. (Johnson and Billings 1962)
- Roosevelt NF, 10730-11800 ft. (Komarkova 1976)
- San Juan NF (Spencer 1975)
- Gunnison NF, 12050 ft. (Komarkova 1986)
- sw Colorado, 11600-13000 ft. (Rottman and Hartman 1985)

ALSO SEE: - Saphp/Caaq  
- Caaq/Caut

GGGCGCGGGGGGGGGCGCGGGGGGGGGCGGGGGGGGGGGCGGGGGGGGGGGCGGG

41216 Capv/Erme

*Carex pyrenaica*/*Erigeron melanocephalus* p.a.  
= Assn. Capy (Komarkova 1976)  
= Assn. Capy, in part (Willard 1979)  
= Judr assn. (Willard 1979)  
= *Carex crandallii*/Erme h.t. (Komarkova 1986)

Snow-bank sites, large snow accumulation in winter, e-se-facing, 2-36% slope, 11000-11900 ft., rocky Cryorthents, pH 5.9.

|                         |                    |
|-------------------------|--------------------|
| Erigeron melanocephalus | Carex pyrenaica    |
| Sibbaldia procumbens    | Poa arctica        |
| Caltha leptosepala      | Carex phaeocephala |

The Roosevelt NF community has more *Antennaria media* and *Juncus drummondii*. The Gunnison NF community has more *Bistorta bistortoides*, *Potentilla diversifolia*, *Luzula spicata*, and *Castilleja occidentalis*.

- Roosevelt NF, 11030-11520 ft. (Komarkova 1976)
- Rocky Mountain NP (Willard 1979)
- Gunnison NF, 11845 ft. (Komarkova 1986)

ALSO SEE: - Anal/Poar - Judr/Sipr  
- Capy/moss - Sipr/Capy

*Capv/moss*

Carex pyrenaica/moss p.a.  
= Assn. Cpy, in part (Willard 1979)

Snow-bank sites, large snow accumulation in winter, n-ne-facing, ca. 10% slopes.

|                                                                                                                                                |                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| <i>Caltha leptosepala</i><br><i>Anemonastrum narcissiflorum</i><br><i>Salix arctica</i><br><i>Senecio crocatus</i><br><i>Bistorta vivipara</i> | <i>Carex pyrenaica</i><br><i>Carex scopulorum</i><br><i>Festuca brachyphylla</i> |
|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|

- Rocky Mountain NP (Willard 1979)

[illegible]

*Carex rupestris*/*Kobresia myosuroides* p.a.  
= Caru/Liob h.t. in part (Komarkova 1986)

Very shallow, slightly rocky soils, fellfields or saddles, wind-exposed sites, pH 7.0.

|                         |                            |
|-------------------------|----------------------------|
| Artemisia scopulorum    | Carex rupestris            |
| Potentilla uniflora     | Kobresia myosuroides       |
| Sedum lanceolatum       | Poa glauca                 |
| Rydbergia grandiflora   | Calamagrostis purpurascens |
| Polemonium viscosum     | Helictotrichon mortonianum |
| Castilleja occidentalis |                            |
| Erigeron pinnatisectus  |                            |

- Gunnison NF, 12740 ft. (Komarkova 1986)

ALSO SEE: - Komy/Acro-Caru

[illegible]

Carex rupestris/Lidia biflora p.a.

= Assn. POTE-Caru (Komarkova 1976)

= POTE-Cary assn. facies ERIT (Willard 1979)

Fellfields or in flat saddles, considerable surface gravel, cobbly-stony subsurface, 1-30% slopes, variety of aspects (mostly not w or sw), wind-exposed sites, no winter snow cover, shallow soils partially of loess, pH 4.5-6.5, 11300-13200 ft.

|                         |                            |
|-------------------------|----------------------------|
| Lidia biflora           | Carex rupestris            |
| Silene acaulis          | Festuca brachyphylla       |
| Acomastylis rossii      | Luzula spicata             |
| Oreoxis alpina          | Helictotrichon mortonianum |
| Castilleja occidentalis | Poa glauca                 |
| Selaginella densa       |                            |
| Paronychia pulvinata    |                            |
| Tonestus pygmaeus       |                            |
| Trifolium nanum         |                            |
| Artemisia scopulorum    |                            |

- Arapaho NF, 12100-12800 ft. (Komarkova 1976)

- Roosevelt NF, 11300-12800 ft.

- nc New Mexico (Baker 1982)

- Rocky Mountain NP (Willard 1979)

- Gunnison NF, 12520 ft. (Komarkova 1986)

The nc New Mexico community (Baker 1982) also has *Arenaria fendleri* and *Oreoxis bakeri*. The Rocky Mountain NP community (Willard 1979) also has *Bistorta bistortoides* and *Sedum lanceolatum*. The Gunnison NF community (Komarkova 1986) also has *Stellaria umbellata*, *Potentilla nivalis*, and *Calamagrostis purpurascens*; *Acomastylis rossii* is absent.

**ALSO SEE:** - Acro/Caru

[illegible]

Carex rupestris/Phlox sibirica p.a.

Gentle slopes and flats, high dry ridgetops almost free of snow.

|                               |                      |
|-------------------------------|----------------------|
| Phlox sibirica spp. pulvinata | Carex rupestris      |
| Smelowskia calycina           | Trisetum spicatum    |
| Acomastylis rossii            | Festuca brachyphylla |
| Eritrichium aretioides        |                      |
| Lomatium spp.                 |                      |
| lichens                       |                      |

- Shoshone NF, 10350 ft. (Johnson and Billings 1962)

[illegible]

Carex rupestris/Trifolium dasyphyllum p.a.

Alpine saddles and moderate middle to upper slopes, variable aspects, slightly protected, thin soils, 11400-12500 ft.

Carex rupestris  
Calamagrostis purpurascens  
Poa glauca  
Danthonia intermedia  
Festuca brachyphylla

- [illegible]

## Casc2/Acro

Hummocks, hollows, and pools alternating with one another, nearly level, and on solifluction terraces, 2-16% slopes of variable aspect.

Carex scopulorum  
Deschampsia cespitosa  
Festuca brachyphylla  
Carex phaeocephala  
Carex hepburnii  
Carex nigricans

- [illegible]

**Casc2/Bivi**

= Bivi/Carex capillaris h.t. (Komarkova 1986)

Carex scopulorum  
Deschampsia cespitosa  
Luzula spicata

- [illegible]

**Casc2/Cale1**

= Rhin-Clrh h.t. (Komarkova 1986) (see phase Rhin)





= Casi c.t. (Youngblood et al. 1985)

a *Salix wolfii*  
a *Betula glandulosa*  
Carex simulata  
Deschampsia cespitosa  
Carex utriculata  
Carex aquatilis  
Carex praegracilis  
Carex nebrascensis

- [illegible]

**Caaq1/Caaq**

= *Caaq1/Callitriche hermaphroditica* h.t. (Komarkova 1986)

Catabrosa aquatica  
Carex aquatilis

- Gunnison NF, 9005 ft. (Komarkova 1986)

[illegible]

Dain/Dece

= Dain/Ersi h.t. (Komarkova 1986)





[illegible]

Dapa1/Feid

|                            |                                   |
|----------------------------|-----------------------------------|
|                            | <i>Pentaphylloides floribunda</i> |
| <i>Achillea lanulosa</i>   | <i>Danthonia parryi</i>           |
| <i>Antennaria rosea</i>    | <i>Festuca idahoensis</i>         |
| <i>Potentilla hippiana</i> | <i>Koeleria macrantha</i>         |
|                            | <i>Carex geyeri</i>               |

- Gunnison NF, 10360 ft. (Komarkova 1985)

[illegible]

41503

Dece/Acro

= Assn. *Stellario laeta*-*Deca* (Komarkova 1976)

= Stla-Deca assn., in part (Willard 1979)

Late snowbank areas, cirque bottoms or n-facing gentle slopes, subalpine meadows, alpine meadows, shallow depressions, and fellfield turfs, moderate to deep loam to sandy loam, moderate surface gravel, moderate (6-29%) to flat slopes, 10600-12900 ft., with moderate to heavy winter snow accumulation, pH around 5.6.

Deschampsia cespitosa  
Festuca brachyphylla  
Agrostis borealis  
Poa glauca  
Poa alpina  
Carex ebenea  
Carex spp.

- Shoshone NF, 10000-10500 ft. (Johnson and Billings 1962)
- Medicine Bow NF, 10600 ft. (Thilenius et al. 1974, Thilenius 1975)
- Arapaho NF (Terwilliger et al. 1979, Hess 1981)
- Roosevelt NF, 11400-12500 ft. (Komarkova 1976, May and Webber 1982, Cox 1933)
- Rocky Mountain NP (Willard 1979)
- ne Utah (Lewis 1970)
- Pike NF (Shepherd 1975)
- White River NF, 11480-12550 ft. (Hess and Wasser 1982, Wasser and Hess 1982)
- nc New Mexico (Baker 1982)
- Gunnison NF, 12885 ft. (Komarkova 1986)
- sw Colorado, 11920-12900 ft. (Rottman 1984)





Wet subalpine meadows and moist bottomlands, poorly drained valley bottoms, and level stream terraces, flooded by spring-summer snowmelt, subirrigated soils with standing water with high available water capacity, 6000-9000 ft. in w Montana, above 9000 ft. in w Colorado.

---

|  |                          |
|--|--------------------------|
|  | Deschampsia cespitosa    |
|  | Carex nebrascensis       |
|  | Carex spp.               |
|  | Calamagrostis canadensis |
|  | Poa spp.                 |
|  | Phleum commutatum        |
|  | Juncus spp.              |

- w Montana, 6000-9000 ft. (Mueggler and Stewart 1980)
- Medicine Bow NF (Terwilliger et al. 1979, Knight and Thilenius 1975)
- Shoshone NF, 6000-9000 ft. (Johnson 1962, Tweit and Houston 1980)
- Rocky Mountain NP, 9400 ft. (Bierly 1972)
- Gunnison NF, above 9000 ft. (Keammerer and Stoecker 1980)
- e Oregon, 2500-6500 ft. (Hall 1973)
- w Wyoming, 6400-9400 ft. (Youngblood et al. 1985, Beetle 1961)
- e Idaho
- n Utah

Also see Deca/Calel p.a., which is closely related. The Carex species cited from the sources listed above are different, although in each case there is a combination of several species. The Shoshone NF community also has: Trifolium parryi, Erigeron simplex, Sibbaldia procumbens, and Agrostis idahoensis.

PHASES: 0. Carex nebrascensis and Carex lanuginosa at lower elevations, with Iris missouriensis, Potentilla pulcherrima, and Danthonia intermedia.

1. Carex species at montane and subalpine elevations, with Carex aquatilis, Carex microptera, Carex utriculata, Carex praegracilis, Carex phaeocephala, Carex hoodii, Carex festivella, Phleum commutatum, Potentilla pulcherrima, Geum macrophyllum, Aster foliaceus -- w Wyoming and Idaho, 6400-9400 ft. (Youngblood et al. 1985); Rocky Mountain NP, 9400 ft. (Bierly 1972); Gunnison NF, 10840 ft. (Komarkova 1986). Communities dominated by Rumex densiflorus may be seral to this. Artemisia cana and/or Pentaptychoides floribunda may invade where trampling and soil compaction has lowered the water table. Salix boothii and/or Salix wolfii are accidental.

2. Higher elevations, high subalpine and alpine, with Carex illota, Eleocharis pauciflora, Bistorta bistortoides, Potentilla diversifolia, Caltha leptosepala, Ranunculus alismaefolius, Trisetum wolfii, Juncus drummondii, and mosses -- Medicine Bow NF, 10000-10560 ft. (Knight and Thilenius 1975). Water may be present on surface during part of growing season.

ALSO SEE: - Case/Dece                      - Cami4/Dece  
               - Cane/Dece                    - Casi/Dece  
               - Pefl/Dece

[illegible]

41505

Dece/Eltr

Deschampsia cespitosa/Elymus trachycaulus p.a.

= Dece/Irmî h.t. (Komarkova 1986)

Gently-sloping valley bottoms with deep soils, Cryoborolls, pH 7.0.

|                      |                                     |
|----------------------|-------------------------------------|
|                      | <b>a Pentaphylloides floribunda</b> |
| Iris missouriensis   | Deschampsia cespitosa               |
| Astragalus alpinus   | Elymus trachycaulus                 |
| Potentilla hippiana  | Elymus longifolius                  |
| Erigeron subtrineris | Poa fendleriana                     |
| Senecio integerrimus | Koeleria macrantha                  |
| Achillea lanulosa    | Juncus arcticus spp. ater           |

- Gunnison NF, 9430 ft. (Komarkova 1986)

[illegible]

41504

Dece/Judr

Deschampsia cespitosa/Juneus drummondii p.a.

= *Antennaria media*-*Poa arctica* h.t. (Komarkova 1986)

Late-melting snow patches, close to the snow patch center, relatively steep (30-35%) southerly slopes, Cryumbrepts, pH 5.4.

|                         |                                      |
|-------------------------|--------------------------------------|
| Antennaria media        | a Salix phylicifolia spp. planifolia |
| Erigeron melanocephalus | Deschampsia cespitosa                |
| Ranunculus macaulevi    | Juncus drummondii                    |

- Gunnison NF, 12245 ft. (Komarkova 1986)

ALSO SEE: - Anne/Poar2

- Judr/CARE

- Saphp/Dece

[illegible]

## DISTICHLIS SPICATA SERIES (416)

41601

Disp/Elsm

*Distichlis spicata/Elytrigia smithii* p.a.

= *Distichlis spicata*/Agsm-Bogr (USDI 1974)

Alluvial lowlands, saline areas around lakes, and flat relatively narrow valleys, 0-10% slope, clay to clay loam soils, precipitation 10-12 in/yr.

|                              |                                                                                                                                                                                                                                                        |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                              | a <i>Atriplex canescens</i><br>a <i>Sarcobatus vermiculatus</i>                                                                                                                                                                                        |
| <i>Suaeda depressa</i>       | <i>Distichlis spicata</i> spp. stricta                                                                                                                                                                                                                 |
| <i>Helianthus petiolaris</i> | <i>Elytrigia smithii</i><br><i>Bouteloua gracilis</i><br><i>Panicum virgatum</i><br><i>Scirpus</i> spp.<br><i>Juncus</i> spp.<br><i>Calamovilfa longifolia</i><br><i>Spartina pectinata</i><br><i>Muhlenbergia asperifolia</i><br><i>Carex siccata</i> |

- s Saskatchewan (Dodd and Coupland 1966)
- nc Nebraska (Frolik and Shepherd 1940)
- Thunder Basin NG, 4000-5000 ft. (USDI 1974)

[illegible]

Disp/Spai-Elsm

*Distichlis spicata*/Sporobolus airoides-Elytrigia smithii p.a.

Flat, narrow slickspots, depressions, valleys, or watercourses, periodically flooded, high water table, compact sand, clay loam or clay (26-34% saturated), precipitation 10-12 in/yr, pH 7.2-9.4 (avg. 8.2), increasing lower, 4000-5400 ft. Total salts 0.0-0.7%.

|                            |                                               |
|----------------------------|-----------------------------------------------|
|                            | a <i>Atriplex canescens</i>                   |
|                            | a <i>Sarcobatus vermiculatus</i>              |
| <i>Talinum parviflorum</i> | <i>Distichlis spicata</i> spp. <i>stricta</i> |
| <i>Iva axillaris</i>       | <i>Sporobolus airoides</i>                    |
| <i>Iva annua</i>           | <i>Sporobolus texanus</i>                     |
| <i>Leucelene ericoides</i> | <i>Elytrigia smithii</i>                      |
|                            | <i>Bouteloua gracilis</i>                     |
|                            | <i>Carex filifolia</i>                        |
|                            | <i>Hordeum jubatum</i>                        |
|                            | <i>Juncus balticus</i>                        |

- ne Colorado, below 5700 ft. (Bunin 1986)
- Pawnee NG, 5400 ft. (McGinnies et al. 1976, Hyder et al. 1966, Costello 1944, Osborn 1974)
- Thunder Basin NG, 4000-5000 ft. (USDI 1974)
- c Nebraska (Ungar 1974)
- nc Kansas (Ungar 1974)
- nc Oklahoma (Ungar 1967-1974)
- nw Utah (Ungar 1974, Bolen 1964, Morden et al. 1986)

PHASE: 1. Suaeda depressa subdominant, salt content (0.2-1.7%), at higher soil pH (7.6-9.2) and with more Atriplex patula, Poa arida, and Scirpus americanus -- c Nebraska and nc Kansas (Ungar 1974)

ALSO SEE: - Disp/Elsm  
- Elsm/Disp  
- SUAE/Saru  
- Juar/Disp

[illegible]

## ELEOCHARIS SPP. SERIES (417)

41701

Elpa/CARE

**Eleocharis palustris/Carex sp. p.a.**

= Elpa c.t. (Youngblood 1985)

Wet meadows, high soil moisture, stability, and snowcover.

|                    |                              |
|--------------------|------------------------------|
|                    | a Pentaphylloides floribunda |
|                    | a Salix wolfii               |
| Caltha leptosepala | Eleocharis palustris         |
|                    | Carex scopulorum             |
|                    | C. praegracilis              |
|                    | Carex aquatilis              |
|                    | Carex illota                 |
|                    | Carex utriculata             |

- Medicine Bow NF. 9800 ft. (Sturges 1968)

- San Juan NF (Webber et al. 1976)
- Shoshone NF, 7500-8000 ft. (Olson and Gerhart 1982)
- ne Colorado, below 5700 ft. (Bunin 1986)
- w Wyoming (Youngblood et al. 1985)

ALSO SEE: - Caaq/Acro

[illegible]

## ELYTRIGIA SMITHII SERIES (401)

40101

Elsm/Bogr

*Elytrigia smithii*/Bouteloua gracilis p.a.

- = Cafi/Agsm (Taylor & Holst 1976)
- = Stcol/Bogr phase Agsm (Mueggler & Stewart 1980)
- = Agsm-Stvi h.t. (Hirsch 1985) (see phase Stvi)

Xeric grassland, loam to clay loam to silt loam soil with a hardpan just below surface, fine-textured, in broad shallow ravines and uplands, high salt content; clay loam-silty clay loam-loam, 1-15% variable aspects, pH 6.0-7.7, 10-19 in precip, 3500-4200 ft. in se Montana.

|                       |                             |
|-----------------------|-----------------------------|
|                       | Toxicodendron rydbergii     |
|                       | Artemisia frigida           |
|                       | Yucca glauca                |
|                       | Symphoricarpos occidentalis |
|                       | Opuntia polyacantha         |
| Gaura coccinea        | Elytrigia smithii           |
| Liatris punctata      | Bouteloua gracilis          |
| Sphaeralcea coccinea  | Carex heliophila            |
| Artemisia dranunculus | Carex eleocharis            |
| Phlox hoodii          | Stipa comata                |
| Achillea lanulosa     | Sporobolus cryptandrus      |
| Selaginella densa     | Aristida longiseta          |
|                       | Carex filifolia             |
|                       | Stipa viridula              |

- A - se Montana, 3500-4200 ft. (Taylor and Holst 1976, Quinnild and Cosby 1958)
- w Montana (Mueggler and Stewart 1980)
- Black Hills NF, 4200 ft. (Pase and Thilenius 1968, Wasser and Hess 1982, Black Hills NF 1985)
- Thunder Basin NG (Steward 1984)
- nw South Dakota (Rauzi et al. 1968, Dix 1960)
- sw North Dakota, 2110 ft. (Hansen et al. 1984, Whitman 1979, Bjugstad 1965)

Associates include *Carex eleocharis*, *Koeleria macrantha*, *Elytrigia dasystachya*, *Heterotheca villosa*, *Antennaria* spp., *Artemisia cana*, *Artemisia tridentata*, *Psoralea agrophylla*, and *Lygodesmia juncea*.

- B - se Montana (Rauzi et al. 1968)
- Nebraska NF (Terwilliger et al. 1979)
- sc South Dakota (Tolstead 1941, Larson and Whitman 1942)
- Buffalo Gap NG
- sw North Dakota (Hansen and Hoffman 1986, Hirsch 1985)
- se Wyoming, 6600 ft. (Beetle 1952)
- Badlands NP (Albertson 1953)



Associates include *Buchloe dactyloides*, *Carex douglasii*, *Poa secunda*, *Machaeranthera pinnatifida*, *Artemisia campestris*, *Amorpha canescens*, *Arenaria hookeri*, and *Lygodesmia juncea*. Mid-seral stands are dominated by *Bouteloua gracilis* and *Buchloe dactyloides*, with a notable decrease in *Carex* spp. and *Elytrigia smithii*.

PHASES: 1. *Stipa comata* conspicuous on low-salt, moderately-deep, level uplands and gradual slopes; soils fine-textured; *Vicia americana* may also be conspicuous -- sw North Dakota (Whitman, 1934, 1979), Thunder Basin NG (Steward 1984).

2. *Stipa viridula* conspicuous on well-drained uplands, low-salt terraces, floodplains, and lower slopes, commonly with *Artemisia cana* and *Andropogon gerardii*, pH 7.3-8.5 -- sw North Dakota (Whitman 1979)

ALSO SEE: - Elsm/Stvi  
- Arca3/Elsm

[illegible]

*Elytrigia smithii*/Carex filifolia p.a.

Rolling uplands, loam to sandy loam soils, pH 6.2-7.7 (mostly 7.2-7.7), 1.8-4.7% organic matter; 0-20% slopes, various aspects.

|                             |                           |
|-----------------------------|---------------------------|
|                             | <i>Artemisia frigida</i>  |
| <i>Selaginella densa</i>    | <i>Elytrigia smithii</i>  |
| <i>Gaura coccinea</i>       | <i>Carex filifolia</i>    |
| <i>Sphaeralcea coccinea</i> | <i>Stipa comata</i>       |
|                             | <i>Stipa viridula</i>     |
|                             | <i>Carex eleocharis</i>   |
|                             | <i>Bouteloua gracilis</i> |
|                             | <i>Koeleria cristata</i>  |

Poa pratensis may invade these stands after grazing use; protection following will increase bluegrass.

- sw North Dakota, 2070-2700 ft. (Hansen et al. 1984, Brand 1980, Hirsch 1985)
- se Montana (Hansen and Hoffman 1986)
- nw South Dakota
- Badlands NP (Albertson 1953)

[illegible]

*Elytrigia smithii*/Carex heliophila p.a.

Heavy-textured soils, low-landscape areas.

|                              |                            |
|------------------------------|----------------------------|
| <i>Astragalus bisulcatus</i> | <i>Elytrigia smithii</i>   |
| <i>Sophora sericea</i>       | <i>Buchloe dactyloides</i> |
| <i>Iva axillaris</i>         | <i>Carex heliophila</i>    |
| <i>Sphaeralcea coccinea</i>  | <i>Bouteloua gracilis</i>  |
| <i>Allium textile</i>        |                            |
| <i>Heterotheca villosa</i>   |                            |

- Pawnee NG (Moir and Trlica 1976)

[illegible]

**Elsm/Disp**

= Saltgrass-western wheatgrass type (Hanson & Whitman 1938)

|                       |                                 |
|-----------------------|---------------------------------|
| Helianthus petiolaris | Elytrigia smithii               |
| Iva xanthifolia       | Distichlis spicata ssp. stricta |
| Plantago patagonica   | Bouteloua gracilis              |
| Lepidium densiflorum  | Stipa comata                    |

- South Dakota and Nebraska NG's (Terwilliger et al. 1979)
- w North Dakota, 3000-3700 ft. (Hanson and Whitman 1938)
- Pawnee NG (Senft et al. 1985)

- Disp/Spai-Elsm

GGGCGCCGCCGGGGGGGGCCCCGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGG

*Elytrigia smithii*/Eleocharis acicularis p.a.

Small playas with deep clayey soils, on nearly level slightly-dissected uplands, periodically inundated, 0-3% slopes, pH 5.8-6.5.

Elytrigia smithii  
Eleocharis acicularis  
Poa juncifolia  
Muhlenbergia richardsonis  
Hordeum jubatum

- Thunder Basin NG, 4600-5000 ft. (USDI 1974)
- nw South Dakota, 3340-3590 ft. (Hansen and Hoffman 1986)

[illegible]

*Elytrigia smithii*/*Stipa viridula* p.a.

Sandy loam soil, northern plains grassland, nearly-level to rolling uplands and isolated buttes and mesas, mostly flat or nearly-flat slopes, 3000-3200 ft., pH 6.2-8.8, moderately high sodium content but low conductivity.

a Juniperus scopulorum  
Artemisia dranunculoides  
Astragalus spp.  
Asclepias stenophylla

*Artemisia frigida*  
*Elytrigia smithii*  
*Stipa viridula*  
*Carex eleocharis*  
*Carex heliophila*  
*Bouteloua gracilis*  
*Stipa comata*  
*Poa* spp.  
*Sporobolus cryptandrus*

- sw South Dakota
- Buffalo Gap NG, 3030 ft.
- sw North Dakota (Hirsch et al. 1984, Whitman 1979)
- Ft. Pierre NG (Bue et al. 1952)

Deep loamy soils in dry to moist valley bottoms, poorly drained.

|                   |                   |
|-------------------|-------------------|
| Achillea lanulosa | Festuca arizonica |
| Penstemon spp.    | Carex heliophila  |
|                   | Juncus spp.       |

*Festuca arizonica*/*Muhlenbergia montana* p.a.

Meadows with deep soils, gravelly Cryoborolls, pH 6.6.

|                              |                                                                      |
|------------------------------|----------------------------------------------------------------------|
|                              | a <i>Picradenia richardsonii</i><br>a <i>Chrysothamnus nauseosus</i> |
| <i>Potentilla hippiana</i>   | <i>Festuca arizonica</i>                                             |
| <i>Aster</i> spp.            | <i>Muhlenbergia montana</i>                                          |
| <i>Vicia americana</i>       | <i>Muhlenbergia filiculmis</i>                                       |
| <i>Geranium caespitosum</i>  | <i>Poa secunda</i>                                                   |
| <i>Antennaria parvifolia</i> | <i>Koeleria macrantha</i>                                            |
| <i>Achillea lanulosa</i>     | <i>Stipa</i> spp.                                                    |
| <i>Eremogone fendleri</i>    | <i>Carex geyeri</i>                                                  |
| <i>Heuchera parvifolia</i>   | <i>Bouteloua gracilis</i>                                            |
| <i>Solidago</i> spp.         | <i>Carex heliophila</i>                                              |
|                              | <i>Festuca saximontana</i>                                           |
|                              | <i>Poa fendleriana</i>                                               |
|                              | <i>Elymus elymoides</i>                                              |

- San Isabel NF (Terwilliger et al. 1979)
- Rio Grande NF, 9000-9200 ft. (Shepherd 1975)
- Pike NF, 7800-9600 ft. (Radloff 1983, Schuster 1964)
- s Colorado (Clary 1978)
- Gunnison NF, 9920 ft. (Komarkova 1986)

*Muhlenbergia montana* may be absent in some areas.

ALSO SEE: - Mumo/Fear1 p.a.  
- Fear1/Cahel  
- Dapa1/Fear1

[illegible]

## FESTUCA IDAHOENSIS SERIES (420)

Upland plateaus and parks in ponderosa-pine forest, loams and sandy loams, pH 6.1-6.7, 5-15% slopes.

Artemisia frigida  
Rosa arkansana



[illegible]

42001

Feid/Elsm

*Festuca idahoensis*/*Elytrigia smithii* p.a.

Gentle slopes (0-15%), 4000-8000 ft., moderately deep sedimentary (esp. limestone) soils.

|                            |                              |
|----------------------------|------------------------------|
|                            | <i>Artemisia frigida</i>     |
| <i>Phlox hoodii</i>        | <i>Festuca idahoensis</i>    |
| <i>Gaillardia aristata</i> | <i>Koeleria macrantha</i>    |
| <i>Antennaria rosea</i>    | <i>Elytrigia dasystachya</i> |
| <i>Achillea lanulosa</i>   | <i>Poa cusickii</i>          |
|                            | <i>Elytrigia smithii</i>     |
|                            | <i>Leucopoa kingii</i>       |
|                            | <i>Poa secunda</i>           |

- Shoshone NF, 5000-8000 ft. (Tweit and Houston 1980)
- w Montana, 4000-6000 ft. (Mueggler and Stewart 1980)

[illegible]

42008

Feid/Eltr

**Festuca idahoensis/Elymus trachycaulus p.a.**

- = Feid/Agropyron caninum h.t. (Mueggler and Stewart 1980)
- = Feid/Agropyron trachycaulum h.t. (Hess and Wasser 1982)
- = Feid/Pofe h.t. (Komarkova 1986)
- = Brin/Koma h.t. (Komarkova 1986)
- = Eltr/Koma h.t. (Komarkova 1986)

Gently-inclined (4-12%) ne-n-facing lower slopes above hydric meadows, moderately deep well-drained moderately permeable soils, pH 5.3-7.3, 9600-10900 ft.

|                           |                     |
|---------------------------|---------------------|
| Potentilla pulcherrima    | Festuca idahoensis  |
| Erythrocoma triflorum     | Elymus trachycaulus |
| Achillea lanulosa         | Carex spp.          |
| Senecio crassulus         | Melica spectabilis  |
| Vicia americana           | Bromus canadensis   |
| Eremogone congesta        | Stipa lettermanii   |
| Dugaldia hoopesii         | Koeleria macrantha  |
| Noccaea montana           | Bromus porteri      |
| Erigeron subtrineris      | Poa fendleriana     |
| Agoseris glauca           |                     |
| Pseudocymopterus montanus |                     |
| Campanula rotundifolia    |                     |

- White River NF, 9600-9850 ft. (Hess and Wasser 1982, Wasser and Hess 1982)
- nc Wyoming (Terwilliger 1979)
- w Wyoming (Beetle 1961)
- w Montana, 6500-8600 ft. (Mueggler and Stewart 1980)
- Gunnison NF, 9190-10810 ft. (Komarkova 1986)

On the Gunnison NF, associated species include *Carex geyeri*, *Agrostis hyemalis*, and *Erigeron subtrinerivus*. Early-seral communities may be dominated by *Koeleria macrantha*, and/or *Bromus inermis*.

PHASE: 1. *Ipomopsis aggregata* on drier upper slopes. -- White River NF (Hess and Wasser 1982)



[illegible]

Level to gently-rolling uplands, convex relief, exposed ridgetops and windswept slopes, 0-10% slope, variable aspects, deep well-drained moderate slowly-permeable soils, pH 5.8-7.4, 9300-9700 ft.

- White River NF, 9350-9680 ft. (Hess and Wasser 1982, Wasser and Hess 1982)
- w Montana, 6500-8600 ft. (Mueggler and Stewart 1980)

[illegible]

Sedimentary soils in moist locations such as swales; fine textured soils.

- Bighorn NF (Terwilliger et al. 1979)

[illegible]

Sedimentary soil on mesic upland at higher elevation; fine textured soil, precipitation 5-7 in from July to October.

293





[illegible]

## Feth/Fear1

|                        |                               |
|------------------------|-------------------------------|
| Potentilla pulcherrima | <i>a Chrysothamnus parryi</i> |
| Aster spp.             | <i>Festuca thurberi</i>       |
| Geranium caespitosum   | <i>Festuca arizonica</i>      |
| Achillea lanulosa      | <i>Festuca idahoensis</i>     |
| Antennaria rosea       | <i>Muhlenbergia montana</i>   |
| Erythrocoma triflora   | <i>Koeleria macrantha</i>     |
| Erigeron subtrinervis  | <i>Carex geyeri</i>           |
| Oxytropis sericea      | <i>Poa fendleriana</i>        |
|                        | <i>Elymus trachycaulus</i>    |
|                        | <i>Bromus porteri</i>         |
|                        | <i>Carex foenea</i>           |

- San Isabel NF (Terwilliger et al. 1979)
- Rio Grande NF
- Gunnison NF, 9760-9959 ft. (Komarkova 1986)
- sc New Mexico, 10200-11100 ft. (Moir 1969)

[illegible]

Feth/Feid

- = Feth/Acla p.a. (Terwilliger et al. 1979)
- = Feid/Feth h.t. (Komarkova 1986)
- = Feid/Stle (Terwilliger et al. 1979)

Heavy, deep soils, 8500-12500 ft.; gently sloping (4-16%) rolling hillsides and well-drained swales, less exposed, more winter snow accumulation than Feid/Gevi, pH 5.8-7.0, 9100-10000 ft., Haplochrepts and Cryochrepts, pH 6.1-6.3.

|                               |                               |
|-------------------------------|-------------------------------|
|                               | a <i>Chrysothamnus parryi</i> |
| <i>Achillea lanulosa</i>      | <i>Festuca thurberi</i>       |
| <i>Solidago multiradiata</i>  | <i>Festuca idahoensis</i>     |
| <i>Vicia americana</i>        | <i>Bromus canadensis</i>      |
| <i>Dugaldia hoopesii</i>      | <i>Elymus trachycaulus</i>    |
| <i>Potentilla pulcherrima</i> | <i>Stipa nelsonii</i>         |
| <i>Viola nuttallii</i>        | <i>Melica spectabilis</i>     |
| <i>Collomia linearis</i>      | <i>Bromus porteri</i>         |
| <i>Agoseris glauca</i>        | <i>Carex geyeri</i>           |
| <i>Erigeron subtrinervis</i>  | <i>Danthonia parryi</i>       |
|                               | <i>Bromus marginatus</i>      |
|                               | <i>Poa</i> spp.               |

- Routt NF (Terwilliger et al 1979)
- Arapaho NF
- Grand Mesa NF
- White River NF, 9180-9760 ft. (Hess and Wasser 1982, Wasser and Hess 1982)





## 44101

Hilaria jamesii/Sporobolus airoides p.a.

Colluvial slopes and alluvial flats, Torriorthents-Torrifluvents-Camborthids, shallow to moderately deep, pH 8.6-8.8.

|  |                        |
|--|------------------------|
|  | Eurotia lanata         |
|  | Gutierrezia sarothrae  |
|  | a Atriplex canescens   |
|  | Opuntia polyacantha    |
|  | Hilaria jamesii        |
|  | Sporobolus airoides    |
|  | Bouteloua gracilis     |
|  | Sporobolus cryptandrus |
|  | Muhlenbergia torreyi   |
|  | Elytrigia smithii      |

- nw New Mexico, 5700-6800 ft. (Francis 1986)

ALSO SEE: - Bogr/Hija  
- Bogr/Bocu phase Spai  
- Spai/Bogr  
- Spai/Elsm

[illegible]

## JUNCUS SPP. SERIES (423)

42301

**Juar/CARE**

Juncus arcticus/Carex spp. p.a.

- = Juba c.t. (Youngblood et al. 1985)
- = Juar/Senecio crassulus (Komarkova 1986)
- = Juba/CARE (Hess and Wasser 1982)

Gentle to flat, alluvial terraces, seeps, poorly-drained bottomlands, and low-lying bogs with moist soil throughout season, soils thick and well developed, water capacity high. Cryaquolls, pH 7.0.

|                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                  | a <i>Salix boothii</i><br>a <i>Artemisia cana</i><br>a <i>Pentophylloides floribunda</i><br>a <i>Salix phylicifolia</i> spp. <i>planifolia</i>                                                                                               |
| <i>Caltha leptosepala</i><br><i>Achillea lanulosa</i><br><i>Bistorta bistortoides</i><br><i>Dodecatheon pulchellum</i><br><i>Ranunculus pedatifidus</i><br><i>Potentilla pulcherrima</i><br><i>Fragaria virginiana</i><br><i>Aster foliaceus</i> | <i>Juncus arcticus</i><br><i>Carex aquatilis</i><br><i>Carex utriculata</i><br><i>Eleocharis acicularis</i><br><i>Deschampsia cespitosa</i><br><i>Poa</i> spp.<br><i>Hierochloa hirta</i><br><i>Carex lanuginosa</i><br><i>C. festivella</i> |

- ne Colorado, below 5700 ft. (Bunin 1986)
- Roosevelt NF, 6560-8200 ft. (Hess 1981, Wasser and Hess 1982)



Early-melting, rocky snow patches, small stands, Cryumbrepts, pH 5.2.

|                         |                       |
|-------------------------|-----------------------|
| Sibbaldia procumbens    | Juncus drummondii     |
| Erigeron melanocephalus | Carex phaeocephala    |
| Acomastylis rossii      | Deschampsia cespitosa |
|                         | Poa arctica           |

- Roosevelt NF, 11080-11440 ft. (Komarkova 1976)
- Gunnison NF, 12245 ft. (Komarkova 1986)

In the Roosevelt NF communities, *Antennaria media*, *Ranunculus adoneus*, and *Carex nigricans* are more important. In the Gunnison NF communities, *Senecio crocatus*, *Erigeron peregrinus*, and *Veronica nutans* are more important.

ALSO SEE: - Anne/Poar2

- Sipr/Capy
- Capv/Judr

[illegible]

## KOBRESIA SPP. SERIES (424)

42401

## Komy/Acro-Caru

**Kobresia myosuroides/Acomastylis rossii-Carex rupestris p.a.**

- = Alpine sedge/hairgrass community (Johnson 1962)
- = Assn. Sede-Komy (Komarkova 1976)
- = *Kobresia bellardii*/Gerol h.t. (Terwilliger et al. 1979, Hess 1981, Hess & Wasser 1982)
- = Caun-Komy assn. (Willard 1979)

Gently rolling benches and ridges, deep to moderately shallow, well drained, permeable soil with light surface rocks, some hummocks on gentle (1-30%) n-nw slopes, gentle slopes to level, low winter snow cover because exposed to winter nw winds, soils thick, well developed, black, pH 4.6-7.7, 11300-12800 ft. in Colorado, lower in n Wyoming.

|                              |                              |
|------------------------------|------------------------------|
| <i>Acomastylis rossii</i>    | <i>Kobresia myosuroides</i>  |
| <i>Bistorta bistortoides</i> | <i>Carex rupestris</i>       |
| <i>Oreoxis alpina</i>        | <i>Trisetum spicatum</i>     |
| <i>Bistorta vivipara</i>     | <i>Carex scopulorum</i>      |
| <i>Silene acaulis</i>        | <i>Deschampsia cespitosa</i> |
| <i>Trifolium dasyphyllum</i> | <i>Poa glauca</i>            |
| <i>Trifolium nanum</i>       |                              |

- Shoshone NF (Johnson 1962, Tweit and Houston 1982)
- Arapaho NF, 11400-12100 ft. (Terwilliger et al. 1979, Hess 1981)
- Roosevelt NF, 11350-12400 ft. (Komarkova 1976, Marr 1967, May and Webber 1982, Cox 1933)
- Gunnison NF, 12500-12600 ft. (Komarkova 1986)
- Pike NF, 11600-12600 ft. (Shepherd 1975)
- San Isabel NF
- San Juan NF, to 12300 ft. (Spencer 1975, Webber et al. 1976)
- White River NF, 11980-12800 ft. (Hess and Wasser 1982, Wasser and Hess 1982)
- Rocky Mountain NP (Kiener 1939, Willard 1979)
- nc New Mexico (Baker 1982)



Alpine fellfield, rocky-gravelly poorly-developed soil avg. 14-40% (ne-se-nnw) slopes, 11500-13220 ft.

|                       |                             |
|-----------------------|-----------------------------|
| Trifolium nanum       | a <i>Salix glauca</i>       |
| Oreoxis spp.          | <i>Kobresia myosuroides</i> |
| Acomastylis rossii    | <i>Poa alpina</i>           |
| Potentilla subjugata  | <i>Festuca brachyphylla</i> |
| Phlox sp.             | <i>Carex</i> spp.           |
| Besseyia alpina       |                             |
| Bistorta bistortoides |                             |
| Lidia biflora         |                             |

- Pike NF (Shepherd 1975)
- San Juan NF (Spencer 1975)

[illegible]

42404

Kosi/Bivi

Kobresia sibirica/Bistorta vivipara p.a.

Small, marshy areas, below lakes and ponds, Cryoborolls.

|                       |                      |
|-----------------------|----------------------|
| Bistorta vivipara     | Kobresia sibirica    |
| Trifolium nanum       | Trisetum spicatum    |
| Trifolium dasyphyllum | Luzula spicata       |
| Thalictrum alpinum    | Kobresia myosuroides |
| Mertensia lanceolata  | Carex scopulorum     |
|                       | Poa glauca           |
|                       | Poa arctica          |

- Gunnison NF, 12750 ft. (Komarkova 1986)
- Arapaho NF

[illegible]

## LEYMUS AMBIGUUS SERIES (418)

41801

Lean/Rice

Leymus ambiguus/Ribes cereum p.a.

Steep canyon walls and talus slopes, all aspects, 70-90% slopes, granite-gneiss-schist, thin soil, pH 6.2-6.4, 5900-7220 ft.

|                       |                               |
|-----------------------|-------------------------------|
|                       | Ribes cereum                  |
|                       | Rhus aromatica spp. trilobata |
|                       | Chrysothamnus nauseosus       |
|                       | <u>Rubus deliciosus</u>       |
| Artemisia ludoviciana | Leymus ambiguus               |
| Heterotheca villosa   | Bouteloua gracilis            |
| Cryptantha virgata    | Stipa scribneri               |

- Roosevelt NF (Hess 1981, Wasser and Hess 1982)
- ne Colorado, above 5800 ft. (Bunin 1986)

[illegible]

MUHLENBERGIA CUSPIDATA SERIES (434)

43401

Mucu/Scsc

Muhlenbergia cuspidata/Schizachyrium scoparium p.a.



Moderately-steep uplands, non-saline loam soils, well-drained, shale parent material.

|               |                              |
|---------------|------------------------------|
|               | <u>Gutierrezia sarothrae</u> |
| Phlox hoodii  | Muhlenbergia cuspidata       |
| Linum rigidum | Schizachyrium scoparium      |
|               | Koeleria macrantha           |
|               | Roegneria spicata            |
|               | Elytrigia dasystachya        |
|               | Stipa comata                 |
|               | Stipa viridula               |
|               | Aristida longiseta           |

- c Montana, 4000-4500 ft. (Jorgensen 1979)
- Thunder Basin NG?

[illegible]

MUHLENBERGIA FILICULMIS SERIES (425)

|       |                                                |             |
|-------|------------------------------------------------|-------------|
| 42501 | Muhlenbergia filiculmis/Artemisia frigida p.a. | Mufil/Arfr1 |
|-------|------------------------------------------------|-------------|

Meadow, steep slopes, rocks and boulders, avg. 30% slope, s-sw aspects, 9200-9600 ft.. Chna dominates visual aspect.

|                             |                         |
|-----------------------------|-------------------------|
|                             | Artemisia frigida       |
|                             | Chrysothamnus nauseosus |
| Picradeniopsis richardsonii | Muhlenbergia filiculmis |
| Eremogone fendleri          | Bouteloua gracilis      |
|                             | Festuca arizonica       |
|                             | Carex obtusata          |
|                             | Koeleria macrantha      |

- Rio Grande NF (Shepherd 1975)

[illegible]

MUHLENBERGIA MONTANA SERIES (426)

42601 *Muhlenbergia montana*/Blepharoneuron tricholepis p.a. Mumol/B1tr

Park-like areas in lower ponderosa pine zone.

|                      |                            |
|----------------------|----------------------------|
| Potentilla spp.      | Artemisia frigida          |
| Aster spp.           | Muhlenbergia montana       |
| Erigeron flagellaris | Blepharoneuron tricholepis |
| Geranium caespitosum | Bouteloua curtipendula     |
| Antennaria spp.      | Schizachyrium scoparium    |
| Achillea lanulosa    | Koeleria macrantha         |
|                      | Elymus elymoides           |
|                      | Bouteloua gracilis         |
|                      | Poa spp.                   |

- Rio Grande NF (Terwilliger et al. 1979)
- San Isabel NF

[illegible]

Muhlenbergia montana/Elytrigia dasystachya p.a.

Shallow, sandy loam with much surface gravel and small rock; occurs on moderate south to east exposed slopes from 7500-8000 ft. elevations.

|                      |                       |
|----------------------|-----------------------|
|                      | Prunus spp.           |
|                      | Artemisia frigida     |
|                      | Ribes cereum          |
|                      | Yucca glauca          |
| Eriogonum umbellatum | Muhlenbergia montana  |
| Grindelia spp.       | Elytrigia dasystachya |
| Helianthus pumilus   | Bouteloua gracilis    |
| Cryptantha virgata   | Bromus spp.           |
| Geranium caespitosum | Poa spp.              |
| Aster spp.           | Leucopoa kingii       |

- Roosevelt NF (Terwilliger et al. 1979)

[illegible]

Muhlenbergia montana/Festuca arizonica p.a.

Arid meadows, avg. 20% s-sw-w slopes, deep fine-textured soils, on rocky terrain, Cryorthents, pH 7.2.

|                             |                                  |
|-----------------------------|----------------------------------|
|                             | a <i>Chrystnhamnus nauseosus</i> |
| Geranium caespitosum        | Muhlenbergia montana             |
| Antennaria rosea            | Festuca arizonica                |
| Erigeron subtrinnervis      | Danthonia parryi                 |
| Astragalus sp.              | Schizachyrium scoparium          |
| Picradeniopsis richardsonii | Bouteloua gracilis               |
| Eremogone fendleri          | Carex geophila                   |
| Antennaria parvifolia       | Muhlenbergia filiculmis          |
| Artemisia frigida           | Koeleria macrantha               |
|                             | Carex obtusata                   |

- Pike NF (Terwilliger et al. 1979)

- Rio Grande NF (Shepherd 1975)

- nc Arizona, ca. 10000 ft. (Rominger and Paulik 1983)

- Gunnison NF, 9440 ft. (Komarkova 1986)

ALSO SEE: - Fear1/Mumol

[illegible]

*Muhlenbergia montana*/*Mertensia lanceolata* p.a.

= Arfr1/Mela h.t. (Komarkova 1986)

= Arfr1/Mumol h.t. (Komarkova 1986)

Warm, dry south-facing rocks and screes. Cryorthents, pH 6.8-7.1.

|                               |                             |
|-------------------------------|-----------------------------|
|                               | a <i>Ribes cereum</i>       |
| <i>Mertensia lanceolata</i>   | <i>Muhlenbergia montana</i> |
| <i>Artemisia frigida</i>      | <i>Festuca arizonica</i>    |
| <i>Geranium richardsonii</i>  | <i>Bromus canadensis</i>    |
| <i>Cheilanthes cancellata</i> | <i>Elymus longifolius</i>   |
|                               | <i>Carex geophila</i>       |

ALSO SEE: - Rice/Field

PHRAGMITES COMMUNIS SERIES (427)

Phco/Cala1

Swamp areas flooded only in the spring. Water table fluctuates from 2 ft. above the surface to 2 ft. below the surface.

**Scirpus acutus**

**Carex lacustris**

[illegible]

42803

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Poar2/Bivi

Along alpine rivulets, late-melting snow patches, Cryorthents, pH 6.5.

*Poa arctica*  
*Festuca brachyphylla*  
*Carex maritima*  
*Luzula spicata*

[illegible]

42801

Pone2/St1e

Gently inclined toeslopes and slopes bordering upland benches, deep well-drained moderate permeable soils, 6-14% s-sw aspects, pH 5.9-7.0, 10300-11400 ft.

Poa nervosa  
Stipa lettermanii  
Poa epilys  
Phleum commutatum  
Festuca brachyphylla  
Trisetum spicatum

305

- Grand Mesa NF, 10300 ft. (Keith et al. 1959)
- c Utah, 10280-10300 ft. (Forsling 1931)

[illegible]

## PUCCINELLIA AIROIDES SERIES (437)

43701

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Puai/Trema

Puccinellia airoides/Triglochin maritima p.a.

Outer edges of saline depressions and salt pans, high water table, 2.1-2.9% total salts, pH 8.1-8.2, higher salt concentration at surface than in subsurface soils.

|                     |                      |
|---------------------|----------------------|
| Triglochin maritima | Puccinellia airoides |
| Salicornia rubra    | Juncus spp.          |
|                     | Phalaris arundinacea |
|                     | Spartina pectinata   |

- Saskatchewan
- ec Colorado (Ungar 1974)
- nc Nebraska (Keim et al. 1932)

In Saskatchewan, *Hordeum jubatum*, *Eleocharis palustris*, *Suaeda erecta*, and *Juncus ater* are associated. In Colorado, *Ranunculus cymbalaria*, *Aster pauciflorus*, *Aster brachyactis*, *Juncus bufonius*, and *Scirpus* spp., are associated.

ALSO SEE: - Dist/Puai  
- Sppe/Caca

[illegible]

## ROEGNERIA SPICATA SERIES (402)

40209

Rosp/Bocu

Roegneria spicata/Bouteloua curtipendula p.a.

Foothills and hillsides along major drainages, 25-37% southerly slopes, reddish porcelaine shale (scoria) substrate, loam soils, pH 7.7.

|                        |                                     |
|------------------------|-------------------------------------|
|                        | Opuntia polyacantha<br>Yucca glauca |
| Artemisia ludoviciana  | Roegneria spicata                   |
| Echinacea angustifolia | Bouteloua curtipendula              |
| Leucelene ericoides    | Carex filfolia                      |
| Ambrosia psilostachya  | Muhlenbergia cuspidata              |
| Phlox hoodii           | Stipa comata<br>Elytrigia smithii   |

- se Montana, 3230-3760 ft. (Hansen and Hoffman 1986)

[illegible]

40208

Rosp/Bogr

Roegneria spicata/Bouteloua gracilis p.a.

= *Agropyron spicatum*/Arf1 h.t., in part (Tiedeman et al. 1987)

Ridges and hills, shallow to moderately deep soils, 10-50% slopes, 10-18 in/yr precipitation, 4500-5000 ft., pH 7.0-7.1.

|                             |                               |
|-----------------------------|-------------------------------|
|                             | a <i>Artemisia tridentata</i> |
| <i>Phlox hoodii</i>         | <i>Bouteloua gracilis</i>     |
| <i>Sphaeralcea coccinea</i> | <i>Roegneria spicata</i>      |
| <i>Psoralea</i> spp.        | <i>Stipa comata</i>           |

- sc Montana (Wright and Wright 1948)
- w Montana, below 6000 ft. (Mueggler and Stewart 1980)
- Thunder Basin NG, 4500-5000 ft. (USDI 1974)
- nc Colorado, 7840-8200 ft. (Tiedeman et al. 1987)

Also see the closely-related Artr/Agsp p.a. The community from w Montana also has *Artemisia frigida*, *Gutierrezia sarothrae*, *Opuntia polyacantha*, *Carex heliophila*, *C. filifolia*, *Poa sandbergii*, and *Koeleria macrantha*. The Thunder Basin NG community, on the other hand, has in addition *Rhus aromatica* spp. *trilobata*, and *Muhlenbergia cuspidata*. *Artemisia tridentata* and *Gutierrezia sarothrae* increase with grazing use.

[illegible]

40210

Rosp/Cafi

Roegneria spicata/Carex filifolia p.a.

Shallow (2-4%) slopes, xeric upland plateaus and buttes, silt loam soils, pH 7.5-7.7.

|                               |                                                          |
|-------------------------------|----------------------------------------------------------|
|                               | <i>Artemisia frigida</i><br><i>Gutierrezia sarothrae</i> |
| <i>Ambrosia psilostachya</i>  | <i>Roegneria spicata</i>                                 |
| <i>Leucelene ericoides</i>    | <i>Carex filifolia</i>                                   |
| <i>Psoralea agrophylla</i>    | <i>Carex heliophila</i>                                  |
| <i>Dalea purpurea</i>         | <i>Koeleria macrantha</i>                                |
| <i>Echinacea angustifolia</i> | <i>Stipa comata</i>                                      |
| <i>Phlox alyssifolia</i>      | <i>Poa canbyi</i>                                        |
| <i>Achillea lanulosa</i>      | <i>Carex eleocharis</i>                                  |
| <i>Antennaria rosea</i>       | <i>Elytrigia smithii</i>                                 |
| <i>Polygala alba</i>          |                                                          |

- se Montana, 4110-4120 ft. (Hansen and Hoffman 1986)

[illegible]

40207

Rosp/Elsm

*Roegneria spicata/Elytrigia smithii* p.a.

= *Agropyron spicatum*/Stcol (Terwilliger et al. 1979)

Flat to steeply sloping (11-55%), variable aspect, moderately arid, variety of parent materials (including scoria), pH 6.8-7.7, 3800-6500 ft., precipitation 12-18 in/yr.

|                                                                                                           |                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                           | <i>Artemisia frigida</i><br><i>Gutierrezia sarothrae</i><br><i>Chrysothamnus nauseosus</i>                                                                                                                          |
| <i>Heterotheca villosa</i><br><i>Allium cernuum</i><br><i>Phlox hoodii</i><br><i>Sphaeralcea coccinea</i> | <i>Roegneria spicata</i><br><i>Elytrigia smithii</i><br><i>Koeleria macrantha</i><br><i>Stipa comata</i><br><i>Carex eleocharis</i><br><i>Stipa viridula</i><br><i>Poa secunda</i><br><i>Bouteloua curtipendula</i> |





- These communities also include *Artemisia frigida*, *Phlox hoodii*, *Tetradymia canescens*, *A. tridentata*, *Carex heliophila*, *Festuca idahoensis*, *Stipa comata*, *Elytrigia dasystachya*, *Muhlenbergia filiculmis*, *Achillea lanulosa*, *Erigeron pumilus*, *Balsamorhiza sagittata*, and *Lomatium* spp. Moderately arid sites, 14-20 in precipitation, patches in mosaic with Artr shrubland. The forb layer is different on the two Colorado forests. On the Roosevelt NF, it has *Sedum stenopetalum*, *Castilleja linearifolia*, *Allium geyeri*, and *Eriogonum subalpinum*; whereas on the White River NF, it has *Oxytropis lambertii*, *Potentilla pulcherrima*, *Eremogone fendleri*, *Achillea lanulosa*, and *Potentilla pensylvanica*. *Chrysothamnus viscidiflorus*, *Artemisia tridentata*, or *C. nauseosus* may dominate earlier seral stages.

Roegneria spicata/Stipa comata p.a.

Moderately arid, windswept slopes and ridges, variety of slopes and aspects, volcanics or limestones, thin soils.

- w Montana (Mueggler and Stewart 1980)
- Shoshone NF, 7000-8000 ft. (Hyde and Beetle 1964, Twit and Houston 1980)
- nc Wyoming

[illegible]

Alluvial-colluvial benches and bottoms, and upland benches, shallow rocky soil from limestones-sandstones. Silty sandy clay loam-clay loam-clay, 4-26% variable aspects, 3100-4100 ft. in se Montana, pH 6.8-8.5, 12-19 in/vr precipitation.





- sw South Dakota
- w North Dakota, 2350-3700 ft. (Hanson and Whitman 1938, Hansen et al. 1984)
- sw North Dakota, 3460-3540 ft. (Whitman 1979, Hansen and Hoffman 1986, Hirsch 1985)
- se Montana, 3180-3320 ft. (Hansen and Hoffman 1986)

PHASE: 1. *Stipa comata* conspicuous on sandy soils, with more  
*Calamovilfa longifolia* -- sw North Dakota (Whitman 1979)

**ALSO SEE:** - Ansc/Bocu

[illegible]

Schizachyrium scoparium/Stipa spp. p.a.

Upland slopes, well-drained coarse Haplustolls and Ustipsamments, sandy soils.

|                       |                           |
|-----------------------|---------------------------|
|                       | a Rosa arkansana          |
|                       | a Juniperus horizontalis  |
| Helianthus rigidus    | Schizachyrium scoparium   |
| Artemisia ludoviciana | Stipa spartea             |
| Lactuca pulchella     | Stipa comata              |
| Astragalus spp.       | Dichanthelium wilcoxianum |
| Galium septentrionale | Helictotrichon hookeri    |
| Selaginella densa     | Bouteloua gracilis        |
|                       | Koeleria macrantha        |

- w North Dakota (Redmann 1975)
- nc Nebraska (Keim et al. 1932)

**ALSO SEE: - Juho/Scsc**

- Stsp/Mucu

[illegible]

## SCIRPUS SPP. SERIES (433)

43301

Scam/CARE

Scirpus americanus/Carex spp. p.a.

= Tydo riparian wetland (Baker 1982)

Sandy shores immediately above the water table, stream-sides, constantly wet non-saline, non-alkaline, alluvial silt soils, marshes and reservoir margins. Water movement and exchange is rapid enough to prevent salt buildup. Ph 5.9-7.5.

|                      |                    |
|----------------------|--------------------|
| a Typha latifolia    | Scirpus americanus |
| a Typha domingensis  | Scirpus paludosus  |
| Equisetum laevigatum | Scirpus validus    |
| Glycyrrhiza lepidota | Scirpus acutus     |
| Solidago gigantea    | Carex utriculata   |
| Berula erecta        | Carex nebrascensis |
|                      | Carex siccata      |
|                      | Carex spp.         |
|                      | Carex lanuginosa   |
|                      | Carex aquatilis    |
|                      | Carex vallicola    |



- c Montana, 4000-4500 ft. (Jorgensen 1979)
- c Kansas (Ungar 1964)
- ne Colorado, below 5700 ft. (Bunin 1986)
- Saskatchewan (Ungar 1974)
- w Utah (Bolen 1964)
- nc Nebraska, 2600-3000 ft. (Tolstead 1942)
- nw Colorado (Baker 1982)
- Thunder Basin NG (Steward 1984)

ALSO SEE: - Disp/Elsm  
- Disp/Puai  
- Scam/CARE

[illegible]

|       |                                                  |           |
|-------|--------------------------------------------------|-----------|
| 43801 | Spartina pectinata/Calamagrostis canadensis p.a. | Sppe/Caca |
|-------|--------------------------------------------------|-----------|

Wet soughs, valleys, and depressions along streams and marshes, and edges of prairie ponds, wet meadows, small to large sites, water table at or near surface for some part of growing season.

Spartina pectinata  
Calamagrostis canadensis  
Carex spp.  
Calamagrostis neglecta  
Phalaris arundinacea

- nc Nebraska (Keim et al. 1932)

ALSO SEE: - Caca/Casa2  
- Ange/Sonu ph. Sppe

[illegible]

42902 *Sporobolus airoides*/Bouteloua gracilis p.a. Spai/Bogr

Alluvial flats, Torrifluvents, deep soils (>5 ft.), pH 8.8-9.0.

a *Artemisia cana*  
*Opuntia polyacantha*  
*Sarcobatus vermiculatus*  
*Sporobolus airoides*  
*Bouteloua gracilis*  
*Hilaria jamesii*  
*Sporobolus cryptandrus*  
*Muhlenbergia richardonis*

- nw New Mexico, 5900-6200 ft. (Francis 1986)

ALSO SEE: - Spai/Elsm  
- Hija/Bogr

[illegible]

|                                            |          |
|--------------------------------------------|----------|
| 42901                                      | Spai/Els |
| Sporobolus airoides/Elytrigia smithii p.a. |          |

Flood plains and depressions, Torrifluvents, pH 8.6, deep soils, moderately salty.

**Chrysothamnus viscidiflorus**

|                              |                             |
|------------------------------|-----------------------------|
|                              | <i>Atriplex canescens</i>   |
| <i>Astragalus bisulcatus</i> | <i>Sporobolus airoides</i>  |
| <i>Astragalus drummondii</i> | <i>Elytrigia smithii</i>    |
| <i>Sophora sericea</i>       | <i>Panicum obtusum</i>      |
| <i>Vicia americana</i>       | <i>Buchloe dactyloides</i>  |
| <i>Lathyrus eucosmus</i>     | <i>Bouteloua gracilis</i>   |
| <i>Ratibida tagetes</i>      | <i>Hilaria jamesii</i>      |
|                              | <i>Muhlenbergia torreyi</i> |

Aldous and Shantz (1924), vegetation type 37. Early seral communities are dominated by *Sporobolus airoides*, *Suaeda depressa*, and *Sesuvium verrucosum*. Sharp increases in salinity will cause dramatic reductions in *Sporobolus airoides*. With no increases in salinity, *Sporobolus* will form hummocks that accumulate sand and gradually lose salinity and moisture, followed by invasion by other grasses (Ungar 1974).

[illegible]

|                                               |          |
|-----------------------------------------------|----------|
| 43001                                         | Spas/Scs |
| Sporobolus asper/Schizachyrium scoparium p.a. |          |

|                        |                         |
|------------------------|-------------------------|
| Solidago glaberrima    | Sporobolus asper        |
| Artemisia gnapholodes  | Schizachyrium scoparium |
| Ambrosia coronopifolia | Koeleria macrantha      |
| Helianthus rigidus     | Elytrigia smithii       |
| Drymocallis arguta     |                         |
| Glycyrrhiza lepidota   |                         |
| Erigeron ramosus       |                         |
| Psoralea argophylla    |                         |
| Amorpha canescens      |                         |
| Delphinium virescens   |                         |

[illegible]

43201 Sporobolus heterolepis/Carex spp. p.a. Sphe/CARE

|                       |                            |
|-----------------------|----------------------------|
|                       | Artemisia frigida          |
|                       | Arctostaphylos adenotricha |
| Erigeron spp.         | Sporobolus heterolepis     |
| Achillea lanulosa     | Carex concinna             |
| Potentilla spp.       | Carex foenea               |
| Artemisia ludoviciana | Carex heliophila           |
| Agoseris spp.         | Stipa nelsonii             |
| Senecio neomexicana   | Elytrigia smithii          |
|                       | Danthonia intermedia       |

- Black Hills NF (Black Hills NF 1985, McIntosh 1928)

[illegible]

43202

Sphe/Stsp

Sporobolus heterolepis/Stipa spartea p.a.

Gentle morainal surfaces, dark thick A horizon, well-drained.

|                              |                                |
|------------------------------|--------------------------------|
|                              | a <i>Rosa arkansana</i>        |
| <i>Helianthus rigidus</i>    | <i>Sporobolus heterolepis</i>  |
| <i>Artemisia ludoviciana</i> | <i>Stipa spartea</i>           |
| <i>Psoralea argophylla</i>   | <i>Schizachyrium scoparium</i> |
| <i>Leucelene ericoides</i>   | <i>Stipa comata</i>            |
|                              | <i>Helictotrichon hookeri</i>  |

- w North Dakota (Redmann 1975)

**ALSO SEE:** - Ange/Sphe

[illegible]

## STIPA COMATA SERIES (431)

43103 Stcol/Bogr

*Stipa comata/Bouteloua gracilis* p.a.

= Stcol-Bogr-Bocu assn. (Hanson 1955) (see phase Bocu)

Well-drained loam to sandy loam soils, xeric upland grassland, precipitation 8-14 in/yr. 5300-7700 ft., level to gentle (0-25%) slopes, pH 7.6-8.2.

|                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                  | <i>Artemisia frigida</i><br><i>Gutierrezia sarothrae</i><br><i>Opuntia polyacantha</i><br><i>Eurotia lanata</i>                                                                                                                                                                           |
| <i>Sphaeralcea coccinea</i><br><i>Liatris</i> spp.<br><i>Psoralea</i> spp.<br><i>Allium</i> textile<br><i>Astragalus bisulcatus</i><br><i>Gaura coccinea</i><br><i>Selaginella densa</i><br><i>Heterotheca villosa</i><br><i>Eriogonum umbellatum</i><br><i>Senecio fendleri</i><br><i>Artemisia dranunculus</i> | <i>Stipa comata</i><br><i>Bouteloua gracilis</i><br><i>Elytrigia smithii</i><br><i>Koeleria macrantha</i><br><i>Carex heliophila</i><br><i>Carex filifolia</i><br><i>Schizachyrium scoparium</i><br><i>Bouteloua curtipendula</i><br><i>Aristida longiseta</i><br><i>Carex eleocharis</i> |

- s Alberta (Coupland 1950, Smoliak 1965-1986)

- s Saskatchewan





Potentilla diversifolia  
Erigeron simplex  
Achillea lanulosa  
Sibbaldia procumbens

Carex ebenea  
Stipa comata  
Poa glauca  
Stipa lettermanii  
Stipa nelsonii  
Phleum commutatum  
Carex albonigra  
Deschampsia cespitosa  
Poa cusickii

- Medicine Bow NF, 10300 ft. (Thilenius 1975)

[illegible]

43107

Stcol/Cael

Stipa comata/Carex eleocharis p.a.

Extremely shallow sandy clay or clay loam soils, with bedrock, gravel, or scoria very close to the surface; tops of ridges or upper ridge-slopes, pH 7.1-8.9, high sodium content and moderate electrical conductivity.

Selaginella densa  
Pulsatilla patens  
Artemisia ludoviciana  
Antennaria spp.  
Leucelene ericoides

*Artemisia frigida*  
*Stipa comata*  
*Carex eleocharis*  
*Koeleria macrantha*  
*Muhlenbergia cuspidata*  
*Elymus trachycaulus*  
*Stipa viridula*  
*Poa secunda*  
*Carex filifolia*

- sw North Dakota (Whitman 1979, Hirsch 1985)

ALSO SEE: - Stcol/Cahel

[illegible]

43104

Stcol/Caf1

Stipa comata/Carex filifolia p.a.

Nearly level to gently rolling uplands with sandy to sandy loam, low-salt soils, moderately coarse subsurface, precipitation 10-14 in/yr, pH 5.8-8.7

Machaeranthera pinnatifida  
Artemisia dranunculus  
A. ludoviciana  
Gaura coccinea  
Liatris punctata  
Sphaeralcea coccinea  
Psoralea tenuiflora  
Ratibida columnifera  
Hedeoma drummondii  
Phlox hoodii  
Selaginella densa

Tetradymia canescens  
Opuntia polyacantha  
Artemisia pedatifida  
Stipa comata  
Carex filifolia  
Bouteloua gracilis  
Elytorgia smithii  
Koeleria macrantha  
Elytorgia dasystachya  
Calamovilfa longifolia  
Sporobolus cryptandrus  
Carex heliophila  
Poa spp.  
Oryzopsis hymenoides  
Carex eleocharis

- Stipa comata* decreases first with use, followed by *Carex filifolia*. Mid-seral is an open, patchy stand of *Bouteloua gracilis* and *Buchloe*, with unpalatable forbs, cacti, and *Artemisia frigida* in between the patches of grass. In ne Colorado, a stand of mixed grasses, *Stipa comata*, *Bouteloua gracilis*, and *Carex filifolia*, is most likely seral to *Bogr*/Buda. In sw Wyoming, *Artemisia tridentata*, *Atriplex* spp., and/or *Chrysothamnus* spp., may have invaded this grassland.

Stipa comata/Carex heliophila p.a.

|                       |                    |
|-----------------------|--------------------|
|                       | Artemisia frigida  |
|                       | Rosa arkansana     |
| Artemisia ludoviciana | Stipa comata       |
| Antennaria rosea      | Carex heliophila   |
| Leucelene ericoides   | Stipa viridula     |
| Linum rigidum         | Koeleria macrantha |
|                       | Elytrigia smithii  |
|                       | Bouteloua gracilis |

- PHASE: 1. *Selaginella densa* abundant, with *Stipa comata* very conspicuous, and *Stipa viridula* accidental to absent, on more sandy soils -- se Montana, 3960-4080 ft. (Hansen and Hoffman 1986)

*Stipa comata*/*Elytrigia dasystachya* p.a.

|                   |                        |
|-------------------|------------------------|
| Phlox hoodii      | Artemisia frigida      |
| Selaginella densa | Stipa comata           |
|                   | Elytrigia dasystacha   |
|                   | Stipa spartea          |
|                   | Carex eleocharis       |
|                   | Carex filifolia        |
|                   | Carex heliophila       |
|                   | Koeleria macrantha     |
|                   | Muhlenbergia cuspidata |

- s Saskatchewan (Coupland 1950)
- s Alberta

ALSO SEE: - Stcol/Elda  
- Elsm/Stvi  
- Stsp/Mucu

[illegible]

*Stipa comata*/Muhlenbergia montana p.a.

Moderate slopes (15-25%), se-sw-facing, xeric forest openings and occasionally extensive rolling parklands, 7700-8400 ft., primarily colluvium of granitic and gneiss origins.

|                                                                                                                    |                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                    | <i>Artemisia frigida</i><br><i>Pediocactus simpsonii</i><br><u><i>Leptodactylon pungens</i></u>                                                                                                                             |
| <i>Antennaria rosea</i><br><i>Harbouria trachypleura</i><br><i>Arenaria fendleri</i><br><i>Oxytropis lambertii</i> | <i>Stipa comata</i><br><i>Muhlenbergia montana</i><br><i>Elytrigia smithii</i><br><i>Poa secunda</i><br><i>Bouteloua gracilis</i><br><i>Carex eleocharis</i><br><i>Koeleria macrantha</i><br><i>Muhlenbergia filiculmis</i> |

- Roosevelt NF, 7790-8370 ft. (Hess 1981, Wasser and Hess 1982)

[illegible]

## STIPA SPARTEA SERIES (436)

43602 Stipa spartea/Andropogon gerardii p.a. Stsp/Ange

Dry tallgrass prairie, coarse-textured soils, silt loams, slightly acidic, well drained.

|                        |                        |
|------------------------|------------------------|
| Asclepias verticillata | Stipa spartea          |
| Euphorbia spp.         | Andropogon gerardii    |
|                        | Poa pratensis          |
|                        | Panicum oligosanthos   |
|                        | Bouteloua curtipendula |
|                        | Stipa comata           |
|                        | Sorghastrum avenaceum  |

- e Nebraska (Weaver and Fitzpatrick 1934, Hover and Bragg 1981)
- se South Dakota (Beebe and Hoffman 1968)
- ne Kansas
- e North Dakota (Ralston and Dix 1966)
- s Manitoba

PHASE: 1. *Schizachyrium scoparium* conspicuous on upland sites with more *Sporobolus heterolepis* and *Koeleria macrantha* -- e Nebraska, se South Dakota, and ne Kansas (Weaver and Fitzpatrick 1934, Beebe and Hoffman 1968); -- e North Dakota (Ralston and Dix 1966)

ALSO SEE: - Ange/Scsc

43601

## Stsp/Mucu

Stipa

horizon.

Helianthus rigidus  
Leucelene ericoides  
Echinacea angustifolia  
Selaginella densa  
Comandra pallida

**Rosa arkansana**

## Stipa spartea

*Muhlenbergia cuspidata*

Agropyron spp.

- w North Dakota (Redmann 1975)

**ALSO SEE: - Juho/Scsc**

- Ansc/STIP

- Stsp/Elsm from sw Saskatchewan - se Alberta (Clarke et al.

1942)

[illegible]





## 5. FORBLANDS

## ACOMASTYLIS ROSSII SERIES (502)

50205

Acro/Bibi2

*Acomastylis rossii*/Bistorta bistortoides p.a.

- = *Geum rossii*/Polygonum bistortoides h.t. (Terwilliger et al. 1979, Hess 1981, Hess & Wasser 1982)

Relatively-protected moderate alpine slopes (0-46% slope), shallow to medium-depth sandy loam soils with light to moderate surface rock and gravel, light to moderate winter snow accumulation, pH 4.9-5.2, 11250-13200 ft. in Colorado.

|                                |                              |
|--------------------------------|------------------------------|
| <i>Acomostylis rossii</i>      | <i>Festuca brachyphylla</i>  |
| <i>Bistorta bistortoides</i>   | <i>Carex scopulorum</i>      |
| <i>Lloydia serotina</i>        | <i>Deschampsia cespitosa</i> |
| <i>Artemisia scopulorum</i>    | <i>Trisetum spicatum</i>     |
| <i>Castilleja occidentalis</i> | <i>Poa arctica</i>           |
| <i>Salix arctica</i>           |                              |

- Arapaho NF, 11730-13130 ft. (Hess 1981, Wasser and Hess 1982)
- Roosevelt NF, 11250-12300 ft. (Komarkova 1976)
- Pike NF (Shepherd 1975)
- White River NF, 11810-12800 ft. (Hess and Wasser 1982)
- Shoshone NF, above 9500 ft. (Tweit and Houston 1982)
- San Juan NF (Spencer 1975)
- Gunnison NF, 11805-12800 ft. (Komarkova 1986)

The Arapaho and Roosevelt NF sites are reported by Hess (1981) to also be associated with *Rhodiola integrifolia*, *Mertensia viridis*, *Rydbergia grandiflora*, and *Lidia biflora*. The Rio Grande NF sites (Shepherd 1975) are also associated with *Oreoxis alpina*, *Potentilla subjuga*, and *Kobresia myosuroides*. The White River NF (Hess and Wasser 1982) communities have *Caltha leptosepala*, *Castilleja occidentalis*, *Lloydia serotina*, *Micranthes rhomboidea*, and *Gentiana alga*. The San Juan NF community (Spencer 1975) also has *Sibbaldia procumbens* and *Thalictrum alpinum*. The Gunnison NF community (Komarkova 1986) also has *Podistera eastwoodiae*, *Bistorta vivipara*, *Besseyia alpina*, *Carex phaeocephala*, *Gentiana alga*, *Potentilla diversifolia*, *Sibbaldia procumbens*, *Erigeron peregrinus*, *Viola adunca*, *Carex nova*, *Pedicularis groenlandica*, *Aquilegia coerulea*, *Phleum commutatum*, *Anemonastrum narcissiflorum*, and *Arnica longifolia*.

|       |           |
|-------|-----------|
| 50208 | Acro/Caru |
|-------|-----------|

Acomastylis rossii/Carex rupestris p.a.

- = Caru/Geum rossii h.t. (Hess and Wasser 1982)  
= POTE-Caru assn. (Willard 1979)

Moderately sloping to flat, saddles, and upper slopes, mostly non-northerly, surface gravel and rock, very gravelly, sandy loams and loams, thin soils, pH 4.6-6.1.

|                             |                             |
|-----------------------------|-----------------------------|
| <i>Acomastylis rossii</i>   | <i>Carex rupestris</i>      |
| <i>Artemisia scopulorum</i> | <i>Festuca brachyphylla</i> |
| <i>Trifolium nanum</i>      | <i>Poa glauca</i>           |

- Shoshone NF, 10350 ft. (Johnson and Billings 1962)
- White River NF, 11810-13120 ft. (Hess and Wasser 1982)
- Rocky Mountain NP (Willard 1979)

The White River NF community has more *Oreoxis alpina*, *Tonestus pygmaeus*, *Trifolium nanum*, *Paronychia pulvinata*, and *Poa rupicola* (Hess and Wasser 1982). The Rocky Mountain NP community has more *Rydbergia grandiflora*, *Selaginella densa*, *Helictotrichon mortonianum*, and *Mertensia viridis* (Willard 1979). The Shoshone NF community has more *Phlox sibirica* and *Luzula spicata* (Johnson and Billings 1962).

ALSO SEE: - Caru/Libi

[illegible]

Acomastylis rossii/Poa arctica p.a.

pH 4.5-4.6, alpine meadow, ca. 12200 ft., moderate soil moisture, soil stability, and snowcover.

|                     |                    |
|---------------------|--------------------|
| Acomastylis rossii  | Poa arctica        |
| Thalictrum fendleri | Carex arapahoensis |
| Trifolium nanum     |                    |

- San Juan NF (Webber et al. 1976)

50206 Acro/Trda

*Acomastylis rossii*/Trifolium dasyphyllum p.a.

= *Trda/Geum rossii* c.t. (Thilenius and Smith 1985)

Alpine turf, coarse-textured soils with high organic content, cushion community, windward slopes, little snow accumulation, pH 5.9-6.3, soils shallow to moderately deep and well-developed.

|                         |                       |
|-------------------------|-----------------------|
| Acomastylis rossii      | Deschampsia cespitosa |
| Trifolium dasyphyllum   | Carex rupestris       |
| Artemisia scopulorum    | Carex obtusata        |
| Potentilla diversifolia | Poa spp.              |
| Trifolium parryi        |                       |
| Phlox multiflora        |                       |
| Sedum lanceolatum       |                       |
| Eremogone congesta      |                       |
| Trifolium nanum         |                       |
| Erigeron compositus     |                       |
| Phlox sibirica          |                       |

- Medicine Bow NF, 10300-11000 ft. (Smith 1969)
- Shoshone NF, 10975 ft. (Thilenius and Smith 1985)

50207 Acro/Trna

Acomastylis rossii/Trifolium nanum p.a.

= *Geum rossii*/Trna c.t. (Thilenius and Smith 1985)

Moderately-steep, upper and middle slopes, exposed to wind, very little snow accumulation, variety of cryic soils, shallow and stoney sandy loams. pH 4.9-5.9.

Acomastylis rossii  
 Trifolium nanum  
 Sedum lanceolatum  
 Phlox multiflora  
 Bistorta bistortoides  
 Erigeron simplex

Poa spp.  
 Carex albonigra  
 Elymus scribneri  
 Carex rupestris  
 Luzula spicata  
 Deschampsia cespitosa

- Shoshone NF, 10300-11000 ft. (Thilenius and Smith 1985, Johnson and Billings 1962)

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- 50203 Acro/TRIF-Dece

Acomastylis rossii/Trifolium sp.-Deschampsia cespitosa p.a.

- = Geum rossii/Trpa c.t. (Thilenius and Smith 1985)

Around stone nets, solifluction terraces, and stripes, or on steep rocky n-slopes, protected from strong winds, pH 4.2-5.9, soil moisture and snowcover intermediate to deep; soil stability intermediate-high; 40% slopes, variety of aspects, Cryochrepts and Cryumbrepts.

Acomastylis rossii  
 Trifolium sp.  
 Senecio crassulus  
 Artemisia scopulorum  
 Caltha leptosepala  
 Bistorta vivipara  
 Trifolium nanum  
 Salix reticulata spp. nivalis  
 Potentilla diversifolia  
 Selaginella densa  
 Lidia biflora  
 Bistorta bistortoides

Deschampsia cespitosa  
 Carex ebenea  
 Carex albonigra  
 Carex obtusata  
 Carex rupestris  
 Festuca brachyphylla

- San Juan NF (Webber et al. 1976)
- Roosevelt NF, 11700 ft. (Cox 1933)
- nc New Mexico, 11700-12500 ft. (Baker 1982)
- Shoshone NF, 10350-10700 ft. (Thilenius and Smith 1985, Johnson and Billings 1962)
- Medicine Bow NF, 10600 ft. (Thilenius 1975)

In Wyoming, San Juan NF, and Roosevelt NF, Trifolium parryi is present; but in nc New Mexico it is replaced by T. brandegei.

ALSO SEE: - Dece/Acro  
 - Trpa/Acro

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#### ANTENNARIA MEDIA SERIES (509)

50901

Anne/Poar2

Antennaria media/Poa arctica p.a.

- = Assn. Epan-Amal (Komarkova 1976)
- = Assn. Judr (Komarkova 1976) - see phase Judr

Upper alpine, moderate to high snow cover, mostly s-se-facing 0-25% slopes, rocky surface with moderate to moderately-high clay, thin A horizon, pH avg. 4.9-5.2, 11000-11900 ft.

Antennaria media  
Erigeron melanocephalus  
Sibbaldia procumbens  
Epilobium anagallidifolium

Poa arctica  
Juncus drummondii  
Carex pyrenaica

- Roosevelt NF, 11050-11840 ft. (Komarkova 1976)
- Arapaho NF
- Gunnison NF (Komarkova 1985)

ALSO SEE: - Capy/Judr  
- Capy/moss  
- Sivr/Capy  
- Judr/Sivr

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#### ARTEMISIA ARCTICA SERIES (510)

51001

Arar4/Trpa-Libi

Artemisia arctica/Trifolium parryi-Lidia biflora p.a.  
= Assn. Arar4 (Komarkova 1976)

Upper alpine, variety of aspects (mostly se-facing) 5-50% slopes, open stands with large amount of rock and soil exposed, long snow cover, very thin surface horizon, pH average 5.1, 11200-12100 ft.

Artemisia arctica  
Trifolium parryi  
Lidia biflora  
Bistorta bistortoides  
Artemisia scopulorum  
Lewisia pygmaea  
Silene acaulis  
Acomastylis rossii  
Selaginella densa  
Solidago spathulata

Luzula spicata  
Trisetum spicatum  
Festuca brachyphylla

- Roosevelt NF, 11250-12040 ft. (Komarkova 1976)
- Arapaho NF

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#### CALTHA LEPTOSEPALA SERIES (511)

51101

Cale1/Clrh

Caltha leptosepala/Clementsia rhodantha p.a.  
= Assn. Clementsio rhodanthae-Cale1 (Komarkova 1976)

Marshes, streamsides, and springs, lower alpine near treeline, hygic to hydric, snow-covered in winter, pH avg. 5.1, variety of aspects, 0-30% slopes, 11200-11900 ft.

Caltha leptosepala  
Clementsia rhodantha  
Stellaria umbellata  
Oreoxis spp.  
Pedicularis groenlandica

Carex pachystachya  
Deschampsia cespitosa  
Poa epilis  
Juncus drummondii  
Carex nigricans

- Arapaho NF, 11200-11650 ft. (Komarkova 1976)
- Roosevelt NF, 11840 ft.
- San Juan NF (Spencer 1975)
- Gunnison NF, 11760 ft. (Komarkova 1986)

ALSO SEE: - Casc2/Cale1

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#### CARDAMINE CORDIFOLIA SERIES (512)

51201

Caco2/Cale1

Cardamine cordifolia/Caltha leptosepala p.a.  
= Assn. Epan-Caco2 (Komarkova 1976)

Lower alpine, nw-sw-facing 5-25% slopes, streamsides, seeps, and springs, long snow cover, 11200-11500 ft.

Cardamine cordifolia  
Caltha leptosepala  
Epilobium anagallidifolium  
Pedicularis groenlandica  
Primula parryi  
Rhodiola integrifolia

Poa arctica  
Juncus drummondii

- Arapaho NF, 11220-11420 ft. (Komarkova 1976)
- sw Colorado, 11600-13000 ft. (Rottman and Hartman 1985)

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#### CIRSIIUM SCOPULORUM SERIES (513)

51301

Cisc/Aqco

Cirsium scopulorum/Aquilegia coerulea p.a.  
= Assn. Cisc (Komarkova 1976)

Scree slopes, alpine, mostly s-facing and gently sloping, e-se-w 2-20%, snow-covered in winter, soils with very thin horizons, pH 5.5-6.5, 10990-11480 ft.

Cirsium scopulorum  
Aquilegia coerulea  
Oxyria digyna  
Cystopteris fragilis  
Draba crassifolia  
Viola biflora

Trisetum spicatum  
Festuca brachyphylla

- Arapaho NF (Komarkova 1976)
- Roosevelt NF

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#### CLAYTONIA MEGARHIZA SERIES (501)

50101

Clme/Sasa

Claytonia megarhiza/Sagina saginoides p.a.  
= Assn. Sasa-Clme (Komarkova 1976)

Highest summits and ridges, mostly sw-facing gentle slopes, on exposed ridges, 12800-13500 ft.



Claytonia megarhiza  
Sagina saginoides  
Stellaria umbellata  
Lidia biflora  
Besseyia alpina

**Festuca brachyphylla**  
**Poa lettermanii**

- Arapaho NF (Komarkova 1976)
- Roosevelt NF

|       |           |
|-------|-----------|
| 50102 | Clme/Siac |
|-------|-----------|

*Claytonia megarhiza/Silene acaulis* p.a.

Slight depressions on high ridges and summits, rock crevices, screes,  
Lithic Crvorthents, pH 7.4.

Claytonia megarhiza  
Silene acaulis  
Artemisia scopulorum  
Oxyria digyna  
Cerastium beeringianum  
Ligularia amplexans

**Poa alpina**  
**Festuca brachyphylla**

- Gunnison NF, 12690 ft. (Komarkova 1986)
- sw Colorado (Rottman 1984)

[illegible]

ERIOGONUM SPP. SERIES (528)

52801 *Eriogonum coloradense*/Oxytropis deflexa p.a. Erco3/Oxde

Scree slopes, very sparse vegetation cover. Cryorthents, pH 6.9.

Eriogonum coloradense  
Oxytropis deflexa  
Chaenactis alpina  
Chamerion latifolium

**Poa glauca**  
**Elymus scribneri**

- Gunnison NF, 12050 ft. (Komarkova 1986)

[illegible]

## HEUCHERA SPP. SERIES (514)

51401 Hebr-Hepa2/Erpi2  
Heuchera bracteata-H. parvifolia/Erigeron pinnatisectus p.a.  
= Assn. Hebr-Hepa2 (Komarkova 1976)

Alpine, sw-s-se-facing steep rocky slopes, little snow in winter, very poorly-developed soils, pH 5.1-6.2, 11320-11500 ft.

Heuchera bracteata  
H. parvifolia  
Erigeron pinnatisectus  
Potentilla nivea  
Erysimum nivale

Poa glauca  
Elymus scribneri  
Carex rupestris  
Festuca brachyphylla

- Roosevelt NF (Komarkova 1976)
- Arapaho NF

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### IVESIA GORDONII SERIES (529)

52901

Ivgo/Erfe

*Ivesia gordonii*/*Eremogone fendleri* p.a.

Low alpine ridges, small-sized-scrub slopes, slight vegetation cover. Cryorthents, pH 5.7.

|                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Ivesia gordonii</i><br><i>Eremogone fendleri</i><br><i>Acomastylis rossii</i><br><i>Arnica</i> spp.<br><i>Senecio werneriaefolius</i><br><i>Ligularia holmii</i> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|

- Gunnison NF, 11960 ft. (Komarkova 1986)

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### LIGUSTICUM PORTERI SERIES (503)

50301

Lipo/Lupa3

*Ligusticum porteri*/*Lupinus parviflorus* p.a.  
 = Upland herb c.t. (Langenheim 1962)

Upper elevation of the spruce-fir forest below alpine tundra. More moist than fescue grassland. Finer soil than lodgepole pine sites. Bare soil approx. 3%.

|                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Ligusticum porteri</i><br><i>Lupinus parviflorus</i><br><i>Senecio crassulus</i><br><i>Delphinium barbeyi</i><br><i>Castilleja septentrionalis</i><br><i>Bistorta bistortoides</i><br><i>Potentilla pulcherrima</i><br><i>Achillea lanulosa</i><br><i>Helianthella quinquenervis</i> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

a *Vaccinium myrtillus*

|                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------|
| <i>Carex ebenea</i><br><i>Carex chalciolepis</i><br><i>Phleum commutatum</i><br><i>Poa alpina</i><br><i>Trisetum spicatum</i> |
|-------------------------------------------------------------------------------------------------------------------------------|

- Routt NF (Terwilliger et al. 1979)
- Arapaho NF
- White River NF
- Grand Mesa NF

- Gunnison NF, 10500-12500 ft. (Langenheim 1962, Komarkova 1985)

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50302

Lipo/Viam

*Ligusticum porteri*/*Vicia americana* p.a.

- = Lipo/Viam-Lale h.t. (Hess & Wasser 1982)

Subalpine, swales, land depressions, and sheltered sites, where high winter snow accumulation or other factors causes moist soil through much of the growing season, moderately deep well-drained slowly permeable soils with dense clay subsoil, pH 5.7-6.8, 9500-10500 ft.

*Ligusticum porteri*  
*Vicia americana*  
*Geranium viscosissimum*  
*Achillea lanulosa*  
*Helianthella quinquenervis*  
*Erigeron speciosus*  
*Dugaldia hoopesii*  
*Erigeron elatior*  
*Delphinium barbeyi*  
*Senecio serra*

*Elymus trachycaulus*  
*Melica spectabilis*  
*Bromus marginatus*  
*Festuca thurberi*

- White River NF, 9510-10500 ft. (Hess and Wasser 1982, Wasser and Hess 1982)
- sw Utah, 9200 ft. (Bowns and Bagley 1986)

ALSO SEE: - Potrl/Lipo  
 - Feth/Viam-Lale

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#### MERTENSIA CILIATA SERIES (515)

51501

Meci/Dece

*Mertensia ciliata*/Deschampsia cespitosa p.a.  
 = Assn. Admo-Meci (Komarkova 1976)

Along streams, moist scree, or at the base of wet rocks, lower alpine, snow-covered in winter, mostly e-se-facing 5-25% slopes.

*Mertensia ciliata*  
*Stellaria umbellata*  
*Senecio triangularis*  
*Geum macrophyllum*  
*Heracleum sphondylium*  
*Cardamine cordifolia*  
*Rhodiola integrifolia*

*Deschampsia cespitosa*  
*Carex scopulorum*  
*Poa palustris*  
*Carex microptera*

- Roosevelt NF, 10960-11750 ft. (Komarkova 1976)
- Arapaho NF
- Gunnison NF, 10100 ft. (Komarkova 1986)
- w Wyoming, 7900-8900 ft. (Youngblood et al 1985)

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#### OREOXIS SPP. SERIES (523)

52301

Orba/Saar-Sede

*Oreoxis bakeri*/Salix arctica-Selaginella densa p.a.

Flat to gently sloping (0-28%) alpine ridges, pH 4.3-4.6, predominantly ne-nw slopes.

*Oreoxis bakeri*  
*Salix arctica*  
*Selaginella densa*  
*Artemisia scopulorum*  
*Erigeron simplex*  
*Sibbaldia procumbens*

*Festuca brachphylla*  
*Trisetum spicatum*  
*Luzula spicata*  
*Carex nigricans*

Lloydia serotina  
 Veronica nutans  
 Bistorta vivipara  
 Silene acaulis

- San Juan NF (Spencer 1975)

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# PARONYCHIA PULVINATA SERIES (504)

50401

Papu/Libi

Paronychia pulvinata/Lidia biflora p.a.

- = Assn. SILE-PARO (Komarkova 1976)
- = Papu/Arenaria obtusiloba p.a. (Terwilliger et al. 1979)
- = Siac-Papu assn. (Willard 1979)

Flat tops of exposed ridges, cushion-plant community, shallow gravelly, sandy loam with open rocky surfaces, exposed to strong wind, snow-free in winter, variable exposures, 2-25% slopes, 11400-13900 ft.

Paronychia pulvinata  
 Lidia biflora  
 Trifolium nanum  
 Silene acaulis  
 Artemisia scopulorum  
 Acomastylis rossii  
 Eremogone fendleri  
 Bistorta bistortoides  
 Tonestus pygmaeus  
 Claytonia megarrhiza  
 Phlox sibirica  
 Eritrichium aretioides  
 Lloydia serotina  
 Oreoxis alpina  
 mosses

Carex rupestris  
 Festuca brachyphylla  
 Poa arctica  
 Calamagrostis purpurascens

- Arapaho NF (Terwilliger et al. 1979, Komarkova 1976)
- Roosevelt NF (Marr 1967, Welden 1981, Cox 1933)
- nc New Mexico (Baker 1983)
- Rocky Mountain NP (Willard 1979)

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# PHLOX SPP. SERIES (525)

52501

Phsi/Trda

Phlox sibirica/Trifolium dasyphyllum p.a.

Lee side of ridges, moderately steep slopes, much exposed surface rock, cryic soils with cambic horizons, moderately deep, very stoney, pH 6.0-6.6.

Phlox sibirica  
 Trifolium dasyphyllum  
 Artemisia scopulorum  
 Lomatium montanum  
 Oxytropis parryi

Poa spp.  
 Carex elynoides

- Shoshone NF, 10565 ft. (Thilenius and Smith 1985)

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PHYSARIA SPP. SERIES (526)

52601

Phal/Peha

*Physaria alpina*/*Penstemon harbourii* p.a.

Steep, fast-moving scree slopes, vegetation cover very sparse, poor soil development limited to small pockets.

*Physaria alpina*  
*Penstemon harbourii*  
*Tonestus pygmaeus*  
*Antennaria umbrinella*  
*Potentilla hookeriana*  
*Erigeron pinnatisectus*  
*Oxytropis deflexa*

*Trisetum spicatum*

- Gunnison NF, 12350 ft. (Komarkova 1986)

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POLEMONIUM VISCOSUM SERIES (516)

51602

Povi/Erpi

*Polemonium viscosum*/*Erigeron pinnatisectus* p.a.

Near alpine treeline, Cryochrepts, pH 6.1.

*Polemonium viscosum*  
*Erigeron pinnatisectus*  
*Trifolium dasyphyllum*  
*Polemonium pulcherrimum*  
*Lidia biflora*  
*Mertensia lanceolata*

*Elymus scribneri*  
*Festuca brachyphylla*  
*Carex foenea*

- Gunnison NF, 11810 ft. (Komarkova 1986)

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51601

Povi/Phse-Cisc

*Polemonium viscosum*/*Phacelia sericea*-*Cirsium scopulorum* p.a.

= Assn. Phse-Povi (Komarkova 1976)

Lower alpine scree slopes, fine talus moving slowly, little snow cover in winter, xeric warm unstabilized, soils with one horizon, pH 5.6-7.4, 11390-11520 ft.

*Polemonium viscosum*  
*Cirsium scopulorum*  
*Cerastium arvense*  
*Phacelia sericea*  
*Campanula rotundifolia*  
*Heuchera parvifolia*  
*Ligularia holmii*  
*Achillea lanulosa*

*Trisetum spicatum*  
*Festuca brachyphylla*

- Roosevelt NF (Komarkova 1976)



ALSO SEE: - *Potentilla viscosum*-*Angelica grayi*-*Primula parryi* on scree slopes, Gunnison NF, 12915 ft. (Komarkova 1986)

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# PRIMULA PARRYI SERIES (517)

51701

Prpa2/Dece

*Primula parryi*/*Deschampsia cespitosa* p.a.

= Assn. Epan-Prpa2 (Komarkova 1976)

= Prpa2/Epan h.t. (Komarkova 1986)

Streamsides, seeps, and springs, lower alpine, below snowpatches, sub-hydric to hydric, snow-covered in winter, pH avg. 6.2, 11000-12000 ft.

*Primula parryi*  
*Caltha leptosepala*  
*Epilobium anagallidifolium*  
moss

*Deschampsia cespitosa*  
*Juncus drummondii*

- Roosevelt NF, 11070-11920 ft. (Komarkova 1976)

- Arapaho NF, 11320-11340 ft.

- Gunnison NF, 12040 ft. (Komarkova 1986)

ALSO SEE: - Cani/Judr

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# SALIX FORB SPP. SERIES (505)

50501

Saar/Acro

*Salix arctica*/*Acomastylis rossii* p.a.

= Saar/Geum *rossii* (Hess and Wasser 1982)

= Assn. Saar (Komarkova 1986)

Moderately-inclined upper to middle slopes, moderate snow accumulation, exposed to winds, gravel cover on surface, moderately deep and well-drained, Cryochrepts, pH 5.0-5.2.

*Salix arctica*  
*Acomastylis rossii*  
*Artemisia scopulorum*  
*Bistorta bistortoides*  
*Lidia biflora*  
*Bistorta vivipara*  
*Trifolium parryi*

*Festuca brachyphylla*  
*Carex rupestris*

- Shoshone NF, 10200 ft. (Johnson and Billings 1962)

- White River NF, 11810-12390 ft. (Hess and Wasser 1982)

- Arapaho NF, 10690-11640 ft. (Komarkova 1976)

- Roosevelt NF, 11000-11820 ft.

- Rocky Mountain NP (Willard 1979)

PHASES: 1. *Sibbaldia procumbens*

2. *Carex scopulorum* prominent, with *Caltha leptosepala*, *Clementsia rhodantha*, and *Rhodiola integrifolia* --  
Arapaho-Roosevelt NF's (Komarkova 1976)

ALSO SEE: - Trpa/Acro

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50503

Saar/Erme

*Salix arctica*/*Erigeron melanocephalus* p.a.

|                                |                             |
|--------------------------------|-----------------------------|
| <i>Salix arctica</i>           | <i>Luzula spicata</i>       |
| <i>Erigeron melanocephalus</i> | <i>Festuca brachyphylla</i> |
| <i>Selaginella densa</i>       | <i>Poa arctica</i>          |
| <i>Potentilla diversifolia</i> | <i>Poa alpina</i>           |
| <i>Bistorta bistortoides</i>   |                             |
| <i>Antennaria media</i>        |                             |
| <i>Lupinus argenteus</i>       |                             |
| <i>Lidia biflora</i>           |                             |
| <i>Micranthes rhomboidea</i>   |                             |

- Gunnison NF, 11885 ft. (Komarkova 1986)

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50505

Saar/Trpa

*Salix arctica*/*Trifolium parryi* p.a.

Saar/Bivi h.t. (Komarkova 1986)

Small, marshy patches with prolonged snow cover, late-melting snow patches, Cryoborolls, pH 6.2.

|                              |                              |
|------------------------------|------------------------------|
| <i>Salix artica</i>          | <i>Carex nova</i>            |
| <i>Trifolium parryi</i>      | <i>Carex scopulorum</i>      |
| <i>Artemisia scopulorum</i>  | <i>Luzula spicata</i>        |
| <i>Podistera eastwoodiae</i> | <i>Trisetum spicatum</i>     |
| <i>Bistorta vivipara</i>     | <i>Festuca brachyphylla</i>  |
| <i>Caltha leptosepala</i>    | <i>Deschampsia cespitosa</i> |
| <i>Bistorta bistortoides</i> |                              |
| <i>Stellaria longipes</i>    |                              |

- Gunnison NF, 12485 ft. (Komarkova 1986)

ALSO SEE: - Trpa/Acro

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50502

Saren/Acro

*Salix reticulata* spp. *nivalis*/*Acomastylis rossii* p.a.

= Assn. Bivi-Saren (Komarkova 1976)

= Saren/Bivi h.t. (Komarkova 1986)

Wet, cold, near late snowbanks, alpine sites, early- to late-melting, with moderate snow accumulation, minimal insolation, and subsurface seepage, moderate slopes (8-26%) n-e-se-facing, gravelly surface of stabilized scree, moderately deep well-drained soils, pH 4.6-5.5, 10650-13600 ft. Absence of cushion plants.

|                                             |                             |
|---------------------------------------------|-----------------------------|
| <i>Salix reticulata</i> spp. <i>nivalis</i> | <i>Festuca brachyphylla</i> |
| <i>Acomastylis rossii</i>                   | <i>Luzula spicata</i>       |
| <i>Artemisia scopulorum</i>                 | <i>Poa arctica</i>          |
| <i>Bistorta vivipara</i>                    |                             |
| <i>Salix arctica</i>                        |                             |
| <i>Erigeron simplex</i>                     |                             |
| lichens                                     |                             |
| mosses                                      |                             |

- Gunnison NF, 11800-13500 ft. (Komarkova 1986)

- Uncompahgre NF, up to 13600 ft.

- nc New Mexico (Baker 1982)

- San Juan NF (Spencer 1975, Webber et al. 1976)
- Arapaho NF, 10980-11800 ft. (Komarkova 1976)
- Roosevelt NF, 11000-11820 ft.

The southern part of this distribution features conspicuous *Oreoxis bakeri*. The Arapaho-Roosevelt NF community also has *Lloydia serotina*, *Gentiana algida*, and *Castilleja occidentalis*. The Gunnison NF community also has *Podistera eastwoodiae*, *Lidia biflora*, *Thalictrum alpinum*, *Carex scopulorum*, and *Selaginella densa*.

ALSO SEE: - Trpa/Dece  
- Droc/Saren

|       |            |
|-------|------------|
| 50504 | Saren/Vace |
|-------|------------|

Salix reticulata spp. nivalis/Vaccinium cespitosum p.a.  
= Saren/Antennaria media h.t. (Komarkova 1986)

Early-melting snowbanks, below middle-alpine snowbanks, well-drained Cryum-brepts, pH 5.8.

|                               |                      |
|-------------------------------|----------------------|
| Salix reticulata spp. nivalis | Vaccinium cespitosum |
| Sibbaldia procumbens          | Carex maritima       |
| Antennaria media              | Danthonia intermedia |
| Erigeron simplex              | Poa arctica          |
| Acomastylis rossii            | Agostis mertensii    |

- Gunnison NF, 12000 ft. (Komarkova 1986)

ALSO SEE: - Caen/Saren

[illegible]

## SAXIFRAGA SPP. SERIES (518)

51801 Saod/Dece

*Saxifraga odontoloma*/Deschampsia cespitosa p.a.

= Assn. *Philonotido tomentellae*-Saod (Komarkova 1976)

Stream-sides, seeps, marshes, and springs, lower alpine, hygric to hydric, snow-covered in winter, cryaquent, pH avg. 6.0, 11000-11800 ft.

|                            |                       |
|----------------------------|-----------------------|
| Saxifraga odontoloma       | Deschampsia cespitosa |
| Epilobium anagallidifolium | Juncus drummondii     |
| Primula parryi             | Carex nigricans       |
| moss                       |                       |
| Caltha leptosepala         |                       |

- Arapaho NF, 11150-11800 ft. (Komarkova 1976)

- Roosevelt NF, 11020-11190 ft.

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|       |           |
|-------|-----------|
| 51803 | Ciau/Cvfr |
|-------|-----------|

*Ciliaria austromontana/Cystopteris fragilis* p.a.

North-facing rocks, bryophytes and lichens important due to higher moisture than southerly rocks.

| a Ribes inerme

a *Pentaphylloides floribunda*

Ciliaria austromontana  
Cystopteris fragilis  
Cryptogramma acrostichoides  
Saxifraga hyperborea  
Heuchera parvifolia  
Aquilegia coerulea  
Stellaria longipes

*Poa nemoralis* spp. interior  
*Festuca idahoensis*

- Gunnison NF (Komarkova 1986)

ALSO SEE: - Ruid/Hepa2

- Hebr-Hepa2/Erpi

51802 Sase/Febr

*Saxifraga serpyllifolia*/Festuca brachyphylla p.a.

= Assn. Sase (Komarkova 1976)

Nw-facing faces of high peaks, or summit plateaus, very poor soil-formation, pH 5.0-5.7, 11320-13200 ft.

Saxifraga serpyllifolia  
Claytonia megarhiza  
Hypnum revolutum  
Polemonium viscosum

Festuca brachyphylla  
Luzula spicata  
Poa lettermanii

- Roosevelt NF (Komarkova 1976)

- Arapaho NF

[illegible]

SENECIO SPP. SERIES (519)

51902

**Seat/Phhe**

Senecio atratus/Phacelia heterophylla p.a.

Upper montane, steep fast-moving fine scree, very low vegetation cover.

Senecio atratus  
Phacelia heterophylla  
Ligularia amplexans  
Chamerion angustifolium

*Elymus trachycaulus*  
*Poa reflexa*

- Gunnison NF, 11280 ft. (Komarkova 1986)

|                                                                          |  |  |  |  |  |  |           |
|--------------------------------------------------------------------------|--|--|--|--|--|--|-----------|
| FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF |  |  |  |  |  |  |           |
| 51901                                                                    |  |  |  |  |  |  | Setr/Lifi |

Senecio triangularis/Ligusticum filicinum p.a.

= Assn. Lifi-Setr (Komarkova 1976)

Lower alpine, near tree line, streambanks or wet scree, 0-10% slopes, variety of aspects (usually nw-ne-se), snow-covered in winter, 10800-11800 ft.

Senecio triangularis  
Ligusticum filicinum  
Stellaria umbellata  
Caltha leptosepala

Juncus drummondii

- Arapaho NF, 10880-11330 ft. (Komarkova 1976)
- Roosevelt NF, 11160-11750 ft.

ALSO SEE: - *Senecio triangularis*/Trisetum wolfii h.t., with *Stellaria umbellata* and *Deschampsia cespitosa*, along creeks and in wet lowland meadows, Gunnison NF, 11645 ft. (Komarkova 1986)

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# SIBBALDIA PROCUMBENS SERIES (520)

52004 Sibr/Caeb  
Sibbaldia procumbens/Carex ebenea p.a.

|                         |                         |
|-------------------------|-------------------------|
| Sibbaldia procumbens    | Carex ebenea            |
| Viola adunca            | Podagrostis thurberiana |
| Lidia biflora           | Poa reflexa             |
| moss                    | Juncus drummondii       |
| Potentilla diversifolia |                         |

- Medicine Bow NF, 10000-10560 ft. (Knight and Thilenius 1975)

ALSO SEE: - Cani/JUNC

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52002 Sibr/Capy  
Sibbaldia procumbens/Carex pyrenaica p.a.

Alpine, high annual snow depth, low soil moisture during growing season, cold, pH ca. 4.9.

|                         |                       |
|-------------------------|-----------------------|
| Sibbaldia procumbens    | Carex pyrenaica       |
| Lidia biflora           | Juncus spp.           |
| Trifolium parryi        | Deschampsia cespitosa |
| Erigeron melanocephalus | Festuca brachyphylla  |
| Ranunculus adoneus      | Poa reflexa           |

- Roosevelt NF (May and Webber 1982)
- Rocky Mountain NP (Willard 1979)
- c Idaho, above 8000 ft. (Schlatterer 1972)

In nc Colorado (May and Webber 1982, Willard 1979), common species include *Juncus drummondii* and the others listed above. In c Idaho (Schlatterer 1972), common species include *Juncus parryi*, *Cassiope mertensiana*, *Luzula parviflora*, and *Trisetum spicatum*.

ALSO SEE: - Cani/JUNC

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52001 Sibr/Libi-moss  
Sibbaldia procumbens/Lidia biflora-moss p.a.

- = Assn. Toninio-SIBB (Komarkova 1976)
- = Geum rossii/Sibr p.a. (Terwilliger et al. 1979)
- = Leprario-SIBB assn. (Willard 1979)

Within or below snowpatches, upper alpine, gentle (1-20%) mostly se-facing slopes, snow cover melts late, pH avg. 4.8, 11150-12500 ft.

|                      |                      |
|----------------------|----------------------|
| Sibbaldia procumbens | Luzula spicata       |
| moss                 | Festuca brachyphylla |



*Lidia biflora*  
*Antennaria alpina*  
*Acomastylis rossii*  
*Trifolium parryi*  
*Bistorta bistortoides*  
*Ranunculus adoneus*  
*Artemisia scopulorum*  
*Lewisia pygamaea*  
*Erigeron melanocephalus*  
*Chionophila jamesii*

*Agrostis mertensii*  
*Carex* spp.

- Roosevelt NF, 11170-12000 ft. (Komarkova 1976, Terwilliger et al. 1979)
- Arapaho NF
- Rocky Mountain NP (Willard 1963)
- Gunnison NF, 12140-12480 ft. (Komarkova 1986)

PHASE: 1. *Poa arctica* more prominent with *Carex chalciolepis*, *Silene acaulis*, and *Androsace septentrionale*; much less moss cover, and less *Bistorta bistortoides*, and *Acomastylis rossii* -- Arapaho NF, 11440 ft. (Komarkova 1976); Gunnison NF, 12200 ft. (Komarkova 1986)

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#### SMELOWSKIA CALYCINA SERIES (527)

52701

Smca/Arbo

*Smelowskia calycina*/*Artemisia borealis* p.a.

- = Smca/*Oligosporus groenlandicus* h.t. (Komarkova 1986)

Rocky summits and ridgetops, rocky thin soils, pH 7.7.

*Smelowskia calycina*  
*Artemisia borealis*  
*Oxytropis podocarpa*  
*Tonestus pygmaeus*  
*Rydbergia grandiflora*  
*Erigeron vetensis*  
*Potentilla uniflora*

*Carex rupestris*  
*Poa glauca*

- Gunnison NF, 12700 ft. (Komarkova 1986)

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#### SUAEDA SPP. SERIES (522)

52201

SUAE/Saru

*Suaeda* spp./*Salicornia rubra* p.a.

Swales, bottomlands, and saline seeps, permanently wet soils that are extremely saline and alkaline, clay texture, salts forming crusts on surface, pH avg. 7.6, total salts 2.8%.

*Suaeda fruticosa*  
*Suaeda occidentalis*  
*Suaeda depressa*  
*Salicornia rubra*  
*Atriplex patula*

*Puccinellia airoides*  
*Triglochin maritima*  
*Scirpus paludosus*  
*Distichlis spicata*

- c Montana, 4000-4500 ft. (Jorgensen 1979)
- c Colorado, 9510 ft. (Ungar 1974)
- Oklahoma (Ungar 1974)
- c Kansas (Ungar 1964-1974)
- ne South Dakota (Ungar 1970)
- c Nebraska (Ungar et al. 1969)

PHASE: 1. *Puccinellia airoides* codominant with *Salicornia*; *Suaeda* spp. occasional, on higher pH (8.1), moister soils with less salt (0.7%) -- c Colorado (Ungar 1974)

2. *Suaeda* codominant with *Sesuvium verrucosum* on salt pans, 0.2-2.2-4.5% total salts (mostly NaCl), 22-68% saturated, pH 7.8-8.1 -- Oklahoma and c Kansas (Ungar 1974)

ALSO SEE: - Dist/Puai  
- Spai/Elsm

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### TRIFOLIUM SPP. SERIES (506)

50602 Trda/Caru  
*Trifolium dasyphyllum*/*Carex rupestris* p.a.

Rocky slopes, avg. 65% e-slope, 12560-13300 ft.

|                              |                             |
|------------------------------|-----------------------------|
| <i>Trifolium dasyphyllum</i> | <i>Carex rupestris</i>      |
| <i>Eremogone fendleri</i>    | <i>Elymus scribneri</i>     |
| <i>Lidia biflora</i>         | <i>Danthonia intermedia</i> |
| <i>T. nanum</i>              |                             |

- Pike NF (Shepherd 1975)
- nc New Mexico (Baker 1982)

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50601 Trda/Elsc

*Trifolium dasyphyllum*/*Elymus scribneri* p.a.

Talus and scree slopes, near the tops of high ridges, wind abrasion, snowfree year-round, 46-58% slope, 11760-13280 ft.

|                              |                              |
|------------------------------|------------------------------|
| <i>Trifolium dasyphyllum</i> | <i>Elymus scribneri</i>      |
| <i>Cirsium scopulorum</i>    | <i>Deschampsia cespitosa</i> |
| <i>Ligularia holmii</i>      | <i>Trisetum spicatum</i>     |
| <i>Cerastium</i> sp.         | <i>Festuca brachyphylla</i>  |
| <i>Claytonia megarhiza</i>   | <i>Poa</i> sp.               |
| <i>Senecio fremontii</i>     |                              |

- Pike NF (Shepherd 1975)

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50606 Trda/Libi

*Trifolium dasyphyllum*/*Lidia biflora* p.a.

- = Assn. Trda (Komarkova 1976, Willard 1979)
- = Trda/*Arenaria obtusiloba* p.a. (Terwilliger et al. 1976)

Upper alpine, various aspects, 3-20% slopes, moderately rocky, not very wind-exposed, usually snow-covered in winter, relatively deep A & B horizons, pH 4.5-6.0, 10990-11980 ft.

*Poa glauca*  
*Festuca brachyphylla*  
*Helictotrichon mortonianum*  
*Carex rupestris*  
*Calamagrostis purpurascens*

- The forbs in this community are clearly dominant; there are a large number of constant species, most of which have low cover.

Trifolium nanum/Erigeron pinnatisectus p.a.

Festuca brachyphylla  
Poa spp.

- Trifolium nanum*/*Lidia biflora* p.a.

Windswept ridges and exposed upper slopes, 8-26% slope, exposed to strong winter winds, thin, poorly-developed well-drained soils, cushion-plant community, 11500-13950 ft., pH 5.0-5.4.

Carex rupestris  
Festuca brachyphylla  
Poa glauca

- Shoshone NF, 10350 ft. (Johnson and Billings 1962)
- Arapaho NF, 11480-13950 ft. (Hess 1981, Wasser and Hess 1982)
- Roosevelt NF
- White River NF, 11600-13120 ft. (Hess and Wasser 1982)
- Gunnison NF, 12760 ft. (Komarkova 1985)

The Arapaho and Roosevelt NF communities (Hess 1981) have in addition *Festuca brachyphylla*, *Luzula spicata*, *Silene acaulis*, *Geum rossii*, *Artemisia scopulorum*, and *A. patersonii*. Community dominated by *Artemisia scopulorum* and *Elymus scribneri* is seral to the above (Komarkova 1985).

PHASE: 1. *Paronychia pulvinata* codominant with *Trifolium nanum* and *Lidia biflora*; *Artemisia scopulorum*, *Tonestus pygmaeus*, *Silene acaulis*, and *Acomastylis rossii* more prominent,-- White River NF (Hess and Wasser 1982)

ALSO SEE: - Caru/Libi

50604 Trpa/Acro

*Trifolium parryi*/Acomastylis rossii p.a.  
= Assn. Deca-Trpa (Komarkova 1976)

Moderate depth sandy loam with rocky surfaces on level to gentle (0-25%) slopes of variable but mostly se-sw exposure, 11150-12800 ft., with moderate to heavy snow accumulation in winter, pH 4.6-5.3.

|                                | a <i>Vaccinium</i> spp.      |
|--------------------------------|------------------------------|
| <i>Trifolium parryi</i>        | <i>Festuca brachyphylla</i>  |
| <i>Acomastylis rossii</i>      | <i>Kobresia myosuroides</i>  |
| <i>Artemisia scopulorum</i>    | <i>Carex scopulorum</i>      |
| <i>Artemisia arctica</i>       | <i>Carex nigricans</i>       |
| <i>Bistorta bistortoides</i>   | <i>Deschampsia cespitosa</i> |
| <i>Sibbaldia procumbens</i>    | <i>Trisetum spicatum</i>     |
| <i>Caltha leptosepala</i>      | <i>Luzula spicata</i>        |
| <i>Lidia biflora</i>           |                              |
| <i>Potentilla diversifolia</i> |                              |
| <i>Erigeron</i> spp.           |                              |
| <i>Selaginella densa</i>       |                              |
| <i>Silene acaulis</i>          |                              |

- Arapaho NF, 11150-12250 ft. (Komarkova 1976, Terwilliger et al. 1979)
- Roosevelt NF (Marr 1967, Helm 1977)
- San Juan NF (Spencer 1975)
- Rocky Mountain NP, 11280-11600 ft. (Helm 1982)
- Gunnison NF, 12760 ft. (Komarkova 1986)

The San Juan NF community also has *Castilleja occidentalis*, *Salix arctica*, and *Oreoxis bakeri*. It seems to be quite different from the Arapaho-Roosevelt one. The Gunnison NF community also has *Posistera eastwoodiae*, *Salix arctica*, *Carex phaeocephala*, *Erigeron melanocephalus*, *Carex nardina*, and *Castilleja occidentalis*.

ALSO SEE: - Dece/Acro phase Trpa  
- Acro/TRIF-Dece  
- Trpa/Dece

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50608 Trpa/Dece

*Trifolium parryi*/Deschampsia cespitosa p.a.

High mountain meadows and fellfield turfs, rocky edges of hairgrass meadows, abundant exposed rock, gentle stable slopes, gravelly loam soils, 8-19% northerly slopes. Cryumbrepts, pH 5.3.

*Trifolium parryi*  
*Artemisia scopulorum*  
*Bistorta bistortoides*  
*Acomastylis rossii*  
*Potentilla diversifolia*  
*Caltha leptosepala*

*Deschampsia cespitosa*  
*Festuca brachyphylla*  
*Carex scopulorum*  
*Carex illota*

- Shoshone NF, 10000-10500 ft. (Johnson and Billings 1962)
- Roosevelt NF, 11000 ft. (Cox 1933)
- Rio Grande NF, 10600-12840 ft. (Shepherd 1975)
- Gunnison NF, 11625 ft. (Komarkova 1986)

On the Colorado sites, *Kobresia myosuroides* and *Festuca brachyphylla* are more common. In n Wyoming, *Salix reticulata* spp. *nivalis* and/or *Salix arctica* are more common.

ALSO SEE: - SALI/Acro  
- Dece/Acro

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50605 Trpa/Raad

*Trifolium parryi*/Ranunculus adoneus p.a.

Alpine, late snowbanks (later than Trpa/Gero), s-facing, 12300 ft.

*Trifolium parryi*  
*Bistorta bistortoides*  
*Artemisia scopulorum*  
*Ranunculus adoneus*  
*Erigeron simplex*

*Festuca brachyphylla*  
*Trisetum spicatum*  
*Carex albonigra*

- Roosevelt NF (Marr 1967)

There is no *Acomastylis rossii* in this community.

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#### TROLLIUS ALBIFLORUS SERIES (521)

52101 Tral-Lifi/Erpel  
*Trollius albiflorus*-*Ligusticum filicinum*/Erigeron peregrinus p.a.  
= Assn. Lifi-Trla (Komarkova 1976)

Moist sites, streambanks near treeline, snow-covered in winter, Cryochrepts and Cryaquepts, pH avg. 6.5, 10800-11700 ft., variety of aspects, 5-25% slopes.

*Trollius albiflorus*  
*Ligusticum filicinum*

a *Vaccinium cespitosum*  
*Deschampsia cespitosa*  
*Juncus drummondii*



Erigeron peregrinus  
 Bistorta bistortoides  
 Castilleja rhexifolia  
 Potentilla diversifolia  
 Caltha leptosepala  
 Arnica mollis

Poa epilis

- Arapaho NF, 11220-11700 ft. (Komarkova 1976)
- Roosevelt NF, 10850-11080 ft.

ALSO SEE: - Dece/Cale1  
 - Setr/Lifi

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### TYPHA LATIFOLIA SERIES (507)

50701

Tyla/Sala

Typha latifolia/Sagittaria latifolia p.a.

Swamp area flooded throughout the summer, and wetlands below seeps.

Typha latifolia  
 Sagittaria latifolia

Carex lacustris  
 Scirpus acutus  
 Phragmites communis

- Nebraska NF (Terwilliger et al. 1979)
- nc Nebraska, 2600-3000 ft. (Tolstead 1942)
- ne Colorado, below 5700 ft. (Bunin 1986)
- w Wyoming (Youngblood et al. 1985)
- e Idaho
- North Dakota (Sloan 1970)

ALSO SEE: - Scam/CARE.

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### VALERIANA CAPITATA SERIES (508)

50801

Vaca2/Cebe2

Valeriana capitata/Cerastium beeringianum p.a.

Steep scree slopes and talus, vegetation in small islands, soil gravelly loose, 60% e-slope, 11600-12600 ft.

Achillea lanulosa  
 Valeriana capitata  
 Cerastium beeringianum  
 Anaphalis margaritacea  
 Heterotheca villosa  
 Trifolium dasyphyllum  
 Senecio atratus

Chrysothamnus parryi  
 Pentaphylloides floribunda  
 Carex spp.  
 Festuca brachyphylla  
 Poa sp.  
 Kobresia myosuroides

- Pike NF (Shepherd 1975)

52401

Vete/Hesp

- = *Veratrum californicum* c.t. (Youngblood et al. 1985)
- = *Vete/Deba* h.t. (Komarkova 1986)
- = *Vete/Urtica gracilis* h.t. (Komarkova 1986)

Colluvial and alluvial deposits in wide meadows with clay soils, with shallow water tables and high water holding capacity.

|                       |                       |
|-----------------------|-----------------------|
| Veratrum tenuipetalum | Deschampsia cespitosa |
| Thalictrum fendleri   | Poa palustris         |
| Aster engelmannii     | Poa leptocoma         |
| Heracleum sphondylium |                       |
| Mertensia ciliata     |                       |
| Senecio triangularis  |                       |
| Senecio serra         |                       |
| Delphinium barbeyi    |                       |
| Geranium richardsonii |                       |

- w Wyoming, 7600 ft. (Youngblood et al. 1985)
- e Idaho
- n Utah
- Gunnison NF, 8960-10100 ft. (Komarkova 1986)

The similarities of this p.a. to Potr1/Vete, Potr1/Hesp, or Potr1/Thfe1 are striking.

[illegible]

# APPENDIX 1. SUMMARY OF CODES AND NAMES

| DOMINANT LIFE FORM<br>PLANT SERIES<br>PLANT ASSOCIATION <sup>a</sup> |                    |         | DOMINANT LIFE FORM<br>PLANT SERIES<br>PLANT ASSOCIATES <sup>b</sup> |                    |  |
|----------------------------------------------------------------------|--------------------|---------|---------------------------------------------------------------------|--------------------|--|
|                                                                      | PHASE <sup>c</sup> | CODE    |                                                                     | PHASE <sup>c</sup> |  |
| C                                                                    |                    | 0       | CONIFEROUS FORESTS                                                  |                    |  |
| Abco                                                                 |                    | 001     | white fir/                                                          |                    |  |
| Abco-Psme/Acgl                                                       | Acgl               | 00101-0 | Rocky Mountain maple                                                |                    |  |
|                                                                      | Mare               | 00101-1 | Oregon-grape                                                        |                    |  |
|                                                                      | Hodu               | 00101-2 | ocean-spray                                                         |                    |  |
|                                                                      | Alint              | 00101-3 | thinleaf alder                                                      |                    |  |
| Abco-Psme/Amal                                                       |                    | 00111   | Saskatoon serviceberry                                              |                    |  |
| Abco-Psme/Arad                                                       |                    | 00109   | kinnikinnick                                                        |                    |  |
| Abco-Psme/Arpa3                                                      |                    | 00112   | greenleaf manzanita                                                 |                    |  |
| Abco-Psme/Erex                                                       |                    | 00103   | fleabane                                                            |                    |  |
| Abco-Psme/Fear1                                                      | Fear1              | 00104-0 | Douglas-fir/Arizona fescue                                          |                    |  |
|                                                                      | Dapa1              | 00104-1 | Parry oatgrass                                                      |                    |  |
| Abco-Pif1/Fear1                                                      |                    | 00115   | limber pine/Arizona fescue                                          |                    |  |
| Abco-Psme/Hodu                                                       |                    | 00113   | ocean-spray                                                         |                    |  |
| Abco-Psme/Juco                                                       |                    | 00116   | common juniper                                                      |                    |  |
| Abco-Psme/Mare                                                       |                    | 00117   | Oregon-grape                                                        |                    |  |
| Abco-Psme/Phma                                                       |                    | 00118   | mallow ninebark                                                     |                    |  |
| Abco-Psme/Quga                                                       | Quga               | 00105-0 | Gambel oak                                                          |                    |  |
|                                                                      | Fear1              | 00105-2 | Arizona fescue                                                      |                    |  |
|                                                                      | Gatr2              | 00105-3 | sweetscented bedstraw                                               |                    |  |
|                                                                      | Pamy               | 00105-4 | myrtle pachistima                                                   |                    |  |
| Abco-Psme/sparse                                                     |                    | 00102   | sparse                                                              |                    |  |
| Abco-Psme/Syor1                                                      |                    | 00114   | mountain snowberry                                                  |                    |  |
| Abco-Psme/Vamy                                                       |                    | 00110   | Rocky Mtn. whortleberry                                             |                    |  |
| Abla                                                                 |                    | 002     | subalpine fir/                                                      |                    |  |
| Abla/Cagel                                                           |                    | 00201   | elk sedge                                                           |                    |  |
| Abla/Mare                                                            |                    | 00203   | Oregon-grape                                                        |                    |  |
| Abla/Thfel                                                           |                    | 00202   | Fendler meadow-rue                                                  |                    |  |
| Abla-Pien1                                                           |                    | 003     | subalpine fir-Engelmann spruce/                                     |                    |  |
| Abla-Pien1/Acgl                                                      |                    | 00327   | Rocky Mountain maple                                                |                    |  |
| Abla-Pien1/Acru                                                      |                    | 00301   | red baneberry,                                                      |                    |  |
| Abla-Pien1/Arco2                                                     | Arco2              | 00302-0 | heartleaf arnica                                                    |                    |  |
|                                                                      | Asmi               | 00302-1 | decumbent milkvetch                                                 |                    |  |
|                                                                      | Shca               | 00302-2 | buffaloberry                                                        |                    |  |
|                                                                      | Pien1              | 00302-3 | Engelmann spruce                                                    |                    |  |
| Abla-Pien1/Arla                                                      |                    | 00303   | broadleaf arnica                                                    |                    |  |
| Abla-Pien1/Caca                                                      |                    | 00305   | bluejoint reedgrass                                                 |                    |  |
| Abla-Pien1/Carul                                                     | Carul              | 00328-0 | pinegrass                                                           |                    |  |
|                                                                      | Pamy               | 00328-1 | myrtle pachistima                                                   |                    |  |
| Abla-Pien1/Cagel                                                     |                    | 00307   | elk sedge                                                           |                    |  |
| Abla-Pien1/Caro3                                                     |                    | 00326   | Ross sedge                                                          |                    |  |
| Abla-Pien1/Erex                                                      |                    | 00308   | forest fleabane                                                     |                    |  |
| Abla-Pien1/Juco                                                      |                    | 00309   | common juniper                                                      |                    |  |
| Abla-Pien1/Libo                                                      | Libo               | 00310-0 | twinflor                                                            |                    |  |
|                                                                      | Vasc               | 00310-1 | grouse whortleberry                                                 |                    |  |
| Abla-Pien1/Mare                                                      |                    | 00304   | Oregon-grape                                                        |                    |  |
| Abla-Pien1/Meci                                                      |                    | 00306   | mountain bluebells                                                  |                    |  |
| Abla-Pien1/moss                                                      |                    | 00311   | moss                                                                |                    |  |
| Abla-Pien1/Pamy                                                      | Pamy               | 00313-0 | pachistima                                                          |                    |  |
|                                                                      | Psme               | 00313-1 | Douglas-fir                                                         |                    |  |
|                                                                      | Rimo               | 00313-2 | gooseberry currant                                                  |                    |  |

|                  |       |         |                             |
|------------------|-------|---------|-----------------------------|
| Abla-Psme/Phma   |       | 00330   | mallow ninebark             |
| Abla-Pien1/Pone2 |       | 00315   | Wheeler bluegrass           |
| Abla-Pien1/RIBE  | RIBE  | 00322-0 | currant                     |
|                  | Thfel | 00322-1 | Fendler meadow-rue          |
| Abla-Pien1/Rupa  | Rupa  | 00324-0 | thimbleberry                |
|                  | Vasc  | 00324-1 | grouse whortleberry         |
| Abla-Pien1/Sag11 |       | 00323   | grayleaf willow             |
| Abla-Pien1/Setr  |       | 00316   | arrowleaf groundsel         |
| Abla-Pien1/Spbe  |       | 00325   | white spiraea               |
| Abla-Pien1/Thoc  |       | 00318   | western meadowrue           |
| Abla-Pien1/Vace  |       | 00329   | dwarf blueberry             |
| Abla-Pien1/Vag1  | Vag1  | 00319-0 | blue huckleberry            |
|                  | Vasc  | 00319-1 | grouse whortleberry         |
| Abla-Pien1/Vamy  | Vamy  | 00320-0 | Rocky Mountain whortleberry |
|                  | Popul | 00320-1 | skunkleaf polemonium        |
| Abla-Pien1/Vasc  | Vasc  | 00321-0 | grouse whortleberry         |
|                  | Pial  | 00321-1 | whitebark pine              |
|                  | Popul | 00321-2 | skunkleaf polemonium        |
|                  | Cagel | 00321-3 | elk sedge                   |
|                  | Shca  | 00321-6 | buffaloberry                |
|                  | Arco2 | 00321-7 | heartleaf arnica            |
| Pien1            |       | 004     | Engelmann spruce/           |
| Pien1/Arco2      |       | 00401   | heartleaf arnica            |
| Pien1/Cale1      |       | 00402   | marsh-marigold              |
| Pien1/Cadi       |       | 00403   | sedge                       |
| Pien1/Feth       |       | 00416   | Thurber fescue              |
| Pien1-Pipu/Gatr2 |       | 00405   | sweetscented bedstraw       |
| Pien1-Psme/Juco  |       | 00417   | Douglas-fir/common juniper  |
| Pien1/Juco       |       | 00407   | common juniper              |
| Pien1/Libo       |       | 00408   | twinflower                  |
| Pien1/moss       |       | 00406   | moss                        |
| Pien1/Phma       |       | 00409   | mallow ninebark             |
| Pien1/Trda       |       | 00413   | whiproot clover             |
| Pien1/Vace       |       | 00418   | dwarf blueberry             |
| Pien1/Vamy       | Vamy  | 00415-0 | Rocky Mountain whortleberry |
|                  | Popul | 00415-1 | skunkleaf polemonium        |
| Pien1/Vasc       | Vasc  | 00414-0 | grouse whortleberry         |
|                  | Bibil | 00414-1 | bistort                     |
|                  | Luar  | 00414-2 | silvery lupine              |
|                  | Popul | 00414-5 | skunkleaf polemonium        |
| Pigl             |       | 005     | white spruce/               |
| Pigl/Cape4       |       | 00501   | Peck sedge                  |
| Pigl/Juco        |       | 00502   | common juniper              |
| Pigl/Libo        | Libo  | 00503-0 | twinflower                  |
|                  | Vasc  | 00503-1 | grouse whortleberry         |
|                  | Spbe  | 00503-2 | white spiraea               |
| Pipu             |       | 006     | blue spruce/                |
| Pipu/Alint       |       | 00605   | thinleaf alder              |
| Pipu/Amal-Swse   | Amal  | 00601-0 | Saskatoon serviceberry      |
|                  | Swse  | 00601-1 | redosier dogwood            |
| Pipu-Psme/Arad   |       | 00608   | kinnikinnick                |
| Pipu/Arco2       |       | 00602   | heartleaf arnica            |
| Pipu-Psme/Cafo   |       | 00606   | silvertop sedge             |
| Pipu-Pien1/Eqar  |       | 00611   | field horsetail             |
| Pipu-Psme/Erex   |       | 00607   | forest fleabane             |
| Pipu-Psme/Fear1  | Fear1 | 00609-0 | Arizona fescue              |
|                  | Dapal | 00609-1 | Parry oatgrass              |

|                |       |         |                             |
|----------------|-------|---------|-----------------------------|
| Pipu-Psme/Juco | Juco  | 00612-0 | common juniper              |
|                | Cagel | 00612-1 | elk sedge                   |
| Pipu-Psme/Libo | Libo  | 00604-0 | twinflower                  |
|                | Juco  | 00604-3 | common juniper              |
| Pipu-Psme/Mare |       | 00610   | Oregon-grape                |
| Pipu/POA       |       | 00603   | bluegrass                   |
| Pial           |       | 007     | whitebark pine/             |
| Pial/Cagel     | Cagel | 00701-0 | elk sedge                   |
|                | Pico  | 00701-1 | lodgepole pine              |
| Pial/Caro3     | Caro3 | 00702-0 | Ross sedge                  |
|                | Pico  | 00702-1 | lodgepole pine              |
| Pial/Feid      |       | 00704   | Idaho fescue                |
| Pial/Juco      | Juco  | 00705-0 | common juniper              |
|                | Shca  | 00705-1 | buffaloberry                |
| Pial-Pif1/Podi |       | 00703   | varileaf cinquefoil         |
| Pial/Vasc      |       | 00706   | grouse whortleberry         |
| Piar           |       | 008     | bristlecone pine/           |
| Piar/Fearl     |       | 00802   | Arizona fescue              |
| Piar/Feth      |       | 00801   | Thurber fescue              |
| Piar/Juco      |       | 00805   | common juniper              |
| Piar/Rimo      |       | 00804   | gooseberry currant          |
| Piar/Trda      |       | 00803   | whiproot clover             |
| Pico           |       | 009     | lodgepole pine/             |
| Pico/Arad      |       | 00901   | kinnikinnick                |
| Pico/Cagel     | Cagel | 00903-0 | elk sedge                   |
|                | Pamy  | 00903-1 | myrtle pachistima           |
| Pico/Caro3     |       | 00911   | Ross sedge                  |
| Pico/Juco      |       | 00905   | common juniper              |
| Pico/Pone2     |       | 00907   | Wheeler bluegrass           |
| Pico/Shca      | Shca  | 00908-0 | russet buffaloberry         |
|                | Pamy  | 00908-1 | grouse whortleberry         |
| Pico/Vace      |       | 00912   | dwarf blueberry             |
| Pico/Vamy      |       | 00909   | Rocky Mountain whortleberry |
| Pico/Vasc      |       | 00910   | grouse whortleberry         |
| Pif1           |       | 010     | limber pine/                |
| Pif1/Capul     |       | 01002   | purple pinegrass            |
| Pif1/Cele      |       | 01007   | curleaf mountain-mahogany   |
| Pif1/Feid      |       | 01003   | Idaho fescue ,              |
| Pif1/Feth      |       | 01009   | Thurber fescue              |
| Pif1/Juco      |       | 01005   | common juniper              |
| Pif1/Juho      |       | 01008   | creeping juniper            |
| Pif1/Leki      | Leki  | 01004-0 | spike-fescue                |
|                | Pupa  | 01004-1 | pasqueflower                |
|                | Koma  | 01004-2 | prairie junegrass           |
| Pif1/Pavi      |       | 01010   | chokecherry                 |
| Pif1/Rosp      |       | 01001   | bluebunch wheatgrass        |
| Pif1/Trda      |       | 01006   | whiproot clover             |
| Pipo           |       | 011     | ponderosa pine/             |
| Pipo/Arad      |       | 01140   | kinnikinnick                |
| Pipo/Arpa3     | Arpa3 | 01129-0 | greenleaf manzanita         |
|                | Cemo  | 01129-1 | mountain-mahogany           |
| Pipo/Arno      |       | 01131   | black sagebrush             |
| Pipo/Bocu      |       | 01104   | sideoats grama              |
| Pipo/Bogr      | Bogr  | 01127-0 | blue grama                  |
|                | Anha  | 01127-2 | sand bluestem               |
|                | Artr  | 01127-3 | big sagebrush               |
|                | Pied  | 01127-4 | pinon                       |



|                 |       |         |                              |
|-----------------|-------|---------|------------------------------|
| Pipo-JUNI/Bogr  |       | 01103   | juniper/blue grama           |
| Pipo/Cagel      | Cagel | 01105-0 | elk sedge                    |
|                 | Luar  | 01105-1 | silvery lupine               |
|                 | Sela  | 01105-2 | stonecrop                    |
| Pipo/Cahel      |       | 01126   | sun sedge                    |
| Pipo/Caro3      |       | 01106   | Ross sedge                   |
| Pipo/Cele       |       | 01132   | curleaf mountain-mahogany    |
| Pipo/Cemo       |       | 01107   | mountain-mahogany            |
| Pipo-Jusc/Cemo  |       | 01115   | mountain-mahogany            |
| Pipo/Dain       |       | 01108   | timber oatgrass              |
| Pipo/Fearl      | Fearl | 01109-0 | Arizona fescue               |
|                 | Dapal | 01109-1 | Parry oatgrass               |
|                 | Bogr  | 01109-2 | blue grama                   |
| Pipo/Feid       | Feid  | 01110-0 | Idaho fescue                 |
|                 | Arpa3 | 01110-1 | greenleaf manzanita          |
| Pipo/Juco       |       | 01112   | common juniper               |
| Pipo/Juco-Syal  |       | 01113   | common juniper-snowberry     |
| Pipo/Leki       |       | 01111   | spike-fescue                 |
| Pipo-Psme/Mumol | Mumol | 01117-0 | mountain muhly               |
|                 | Cefe  | 01117-1 | Fendler ceanothus            |
|                 | Elda  | 01117-2 | thickspike wheatgrass        |
| Pipo/Pavi       | Pavi  | 01122-0 | chokecherry-common snowberry |
|                 | Cafo  | 01122-1 | silvertop sedge              |
|                 | Amal  | 01122-2 | Saskatoon serviceberry       |
|                 | Mare  | 01122-4 | Oregon-grape                 |
|                 | Quma  | 01122-5 | bur oak                      |
|                 | Ange  | 01122-6 | big bluestem                 |
| Pipo/Phmo       |       | 01119   | mountain ninebark            |
| Pipo/Pied-Quga  |       | 01118   | pinyon-Gambel oak            |
| Pipo/Putr       |       | 01120   | bitterbrush                  |
| Pipo/Quga       | Quga  | 01121-0 | Gambel oak                   |
|                 | Fearl | 01121-1 | Arizona fescue               |
|                 | Syorl | 01121-4 | mountain snowberry           |
|                 | Acne  | 01121-5 | box-elder                    |
| Pipo/Quma       |       | 01151   | bur oak                      |
| Pipo/Rosp       | Rosp  | 01125-0 | bluebunch wheatgrass         |
|                 | Artr  | 01125-1 | big sagebrush                |
| Pipo-Jusc/Rosp  |       | 01101   | bluebunch wheatgrass         |
| Pipo/Scsc-Elsm  |       | 01102   | little bluestem-wheatgrass   |
| Pipo/Scsc       | Scsc  | 01128-0 | little bluestem              |
|                 | Quun  | 01128-1 | wavyleaf oak                 |
| Pipo/Spbe       |       | 01123   | birchleaf spiraea            |
| Pipo/Syal       | Syal  | 01124-0 | common snowberry             |
|                 | Oras  | 01124-2 | roughleaf ricegrass          |
|                 | Mare  | 01124-3 | Oregon-grape                 |
| Pipo-Jusc/Syoc  |       | 01150   | western snowberry            |
| Psme            |       | 012     | Douglas-fir/                 |
| Psme/Acgl       | Acgl  | 01201-0 | Rocky Mountain maple         |
|                 | Pamy  | 01201-1 | myrtle pachistima            |
|                 | Syorl | 01201-2 | mountain snowberry           |
| Psme/Amal       |       | 01222   | Saskatoon serviceberry       |
| Psme/Arad-Juco  |       | 01219   | kinnikinnick-common juniper  |
| Psme/Arpa3      |       | 01220   | greenleaf manzanita          |
| Psme/Arco2      | Arco2 | 01202-0 | heartleaf arnica             |
|                 | Asmi  | 01202-1 | decumbent milkvetch          |

|                  |       |         |                               |
|------------------|-------|---------|-------------------------------|
| Psme/Carul       | Carul | 01205-0 | pinegrass                     |
|                  | Pamy  | 01205-1 | myrtle pachistima             |
|                  | Feid  | 01205-2 | Idaho fescue                  |
|                  | Pipo  | 01205-3 | ponderosa pine                |
| Psme/Cage1       |       | 01206   | elk sedge                     |
| Psme/Caro3       |       | 01204   | Ross sedge                    |
| Psme/Cele        |       | 01223   | curleaf mountain-mahogany     |
| Psme/Cemo        |       | 01207   | mountain-mahogany             |
| Psme/Fear1       |       | 01233   | Arizona fescue                |
| Psme/Feid        |       | 01208   | Idaho fescue                  |
| Psme/Jaam        |       | 01209   | jamesia                       |
| Psme/Juco        |       | 01210   | common juniper                |
| Psme/Mare        | Mare  | 01203-0 | Oregon-grape                  |
|                  | Juco  | 01203-2 | common juniper                |
| Psme/Pamy        |       | 01211   | pachistima                    |
| Psme/Phma        |       | 01212   | mallow ninebark               |
| Psme/Phmo        |       | 01213   | mountain ninebark             |
| Psme/Putr        |       | 01221   | bitterbrush                   |
| Psme/Quga        | Quga  | 01214-0 | Gambel oak                    |
|                  | Fear1 | 01214-1 | Arizona fescue                |
| Psme/Spbe        | Spbe  | 01215-0 | birchleaf spiraea             |
|                  | Carul | 01215-1 | pinegrass                     |
|                  | Pipo  | 01215-3 | ponderosa pine                |
|                  |       | 01216   | common snowberry              |
| Psme/Sya1        |       | 01217-0 | mountain snowberry            |
| Psme/Syor1       | Syor1 | 01217-1 | Oregon-grape                  |
|                  | Mare  | 01217-2 | elk sedge                     |
|                  | Cage1 | 01217-3 | spike-fescue                  |
|                  | Leki  | 01217-4 | bluebunch wheatgrass          |
|                  | Rosp  | 01218   | blue huckleberry              |
| Psme/Vag1        |       | 1       | DECIDUOUS FORESTS             |
| D Bepa           |       | 108     | paper birch/                  |
| Bepa/Coco1       |       | 10801   | beaked hazel                  |
| Frpe             |       | 107     | green ash/                    |
| Frpe/Pavi        | Pavi  | 10702-0 | chokecherry                   |
|                  | Casp  | 10702-1 | Sprengel sedge                |
| Frpe/Syoc        | Syoc  | 10701-0 | western snowberry             |
|                  | Calo  | 10701-1 | prairie sandreed              |
| Osvi             |       | 102     | eastern hophornbeam/          |
| Osvi/Crsu        |       | 10202   | fleshy hawthorn               |
| Osvi-Quma/sparse |       | 10203   | bur oak/sparse understory     |
| Poan3            |       | 103     | narrowleaf cottonwood/        |
| Poan3/Alint-Swse |       | 10306   | alder-redosier dogwood        |
| Poan3/Amal       | Amal  | 10301-0 | Saskatoon serviceberry        |
|                  | Acne  | 10301-1 | box-elder                     |
| Poan3/Befo-RIBE  |       | 10303   | water birch-currant           |
| Poan3-Pien1/Diin |       | 10305   | twinberry                     |
| Poan3/Phmo-Pavi  |       | 10304   | mountain ninebark-chokecherry |
| Poan3/Saex-Befo  |       | 10302   | coyote willow-water birch     |
| Poba             |       | 109     | balsam poplar/                |
| Poba/Swse        |       | 10901   | redosier dogwood              |
| Posa-Powi-Pofr2  |       | 104     | broadleaf cottonwoods/        |
| Posa/Riam        |       | 10404   | American black currant        |
| Posa/Syoc-Leci   | Syoc  | 10401-0 | snowberry-giant wildrye       |
|                  | Swse  | 10401-1 | redosier dogwood              |
| Posa/Syoc-Saex   |       | 10405   | snowberry-coyote willow       |
| Posa/SALI        |       | 10403   | willow                        |

|                              |               |                           |
|------------------------------|---------------|---------------------------|
| Posa-Poan3/SALI              | 10402         | willow                    |
| Potr1                        | 105           | aspen/                    |
| Potr1/Amal-Pavi              | Amal 10515-0  | Saskatoon serviceberry    |
|                              | Acg1 10515-1  | Rocky Mtn. maple          |
|                              | Quga 10515-2  | Gambel oak                |
|                              | Asen 10515-3  | Engelmann aster           |
|                              | Poba 10515-4  | balsam poplar             |
| Potr1/Arad                   | 10521         | kinnikinnick              |
| Potr1/Artr                   | 10514         | big sagebrush             |
| Potr1/Carul                  | 10517         | pinegrass                 |
| Potr1/Cagel                  | 10501         | elk sedge                 |
| Potr1/Ceve                   | 10516         | snowbrush ceanothus       |
| Potr1/Cocol                  | Cocol 10502-0 | beaked hazel-smooth aster |
|                              | Ptaq 10502-1  | bracken fern              |
|                              | Arnul 10502-2 | American spikenard        |
| Potr1/Fearl                  | 10522         | Arizona fescue            |
| Potr1/Feth                   | 10503         | Thurber fescue            |
| Potr1/Hesp                   | 10504         | cow-parsnip               |
| Potr1/Juco                   | 10508         | common juniper            |
| Potr1/Lale                   | 10505         | aspen peavine             |
| Potr1/LIGU                   | 10518         | ligusticum                |
| Potr1/Luarl                  | 10507         | silvery lupine            |
| Potr1/Mare                   | 10520         | Oregon-grape              |
| Potr1/Pavi                   | Pavi 10519-0  | chokecherry               |
|                              | Syal 10519-1  | common snowberry          |
| Potr1/Ptaq                   | 10510         | bracken fern              |
| Potr1/Sara                   | 10523         | elderberry                |
| Potr1/Syorl                  | 10511         | mountain snowberry        |
| Potr1/Thfel                  | Thfel 10512-0 | Fendler meadowrue         |
|                              | Thdi 10512-1  | spreading golden-banner   |
|                              | Urdi 10512-3  | stinging nettle           |
| Potr1/Vete                   | 10513         | false-hellebore           |
| Quma                         | 106           | bur oak/                  |
| Quma/CORY3                   | 10603         | hazel                     |
| Quma/Syoc                    | Syoc 10601-0  | mountain snowberry        |
|                              | Potr1 10601-1 | aspen                     |
| W                            | 2             | WOODLANDS                 |
| Jusc                         | 203           | Rocky Mountain juniper/   |
| Jusc/Artr                    | 20302         | big sagebrush             |
| Jusc/Cemo                    | 20304         | mountain-mahogany         |
| Jusc/Elsm                    | 20301         | western wheatgrass        |
| Jusc/Ormi                    | 20307         | littleseed ricegrass      |
| Jusc/Putr                    | 20306         | bitterbrush               |
| Jusc/Rosp                    | 20303         | bluebunch wheatgrass      |
| Jumo )                       | 201           | oneseed juniper/ )        |
| Juos )-arranged by subdomin- | 202           | Utah juniper/ )           |
| Pied ) ants                  | 204           | pinyon/ )                 |
| Pied-Juos/Amut-Cemo          | Amut 20403-0  | Utah serviceberry         |
|                              | Arpa3 20403-1 | greenleaf manzanita       |
| Pied/Arno                    | 20410         | black sagebrush           |
| Pied-Juos/Artr               | Artr 20401-0  | big sagebrush             |
|                              | Bogr 20401-1  | blue grama                |
| Juos/Artr                    | 20202         | big sagebrush             |
| Jumo/Bocu                    | 20101         | sideoats grama            |
| Pied/Bogr                    | 20402         | blue grama                |
| Jumo/Bogr                    | 20102         | blue grama                |

|                 |       |         |                                |
|-----------------|-------|---------|--------------------------------|
| Pied-Jumo/Cemo  |       | 20407   | oneseed/mountain-mahogany      |
| Pied-Juos/Cemo  | Cemo  | 20409-0 | Utah/mountain-mahogany         |
|                 | Quga  | 20409-1 | Gambel oak                     |
| Juos/Cemo-Pera2 | Cemo  | 20203-0 | mountain-mahogany              |
|                 | Artrw | 20203-1 | Wyoming big sagebrush          |
| Jumo/Elsm       |       | 20103   | western wheatgrass             |
| Juos/Mafr       |       | 20205   | Fremont mahonia                |
| Juos/Orhy       |       | 20204   | Indian ricegrass               |
| Pied-Juos/Pofe  |       | 20406   | muttongrass                    |
| Pied-Juos/Putr  |       | 20405   | bitterbrush                    |
| Pied/Quga       |       | 20404   | Gambel oak                     |
| Juos-Pied/Rosp  |       | 20201   | bluebunch wheatgrass           |
| Pied-Jumo/Stnel |       | 20408   | Letterman needlegrass          |
| S               |       | 3       | SHRUBLANDS                     |
| Acgl            |       | 330     | Rocky Mountain maple/          |
| Acgl/Swse       |       | 33001   | redosier dogwood               |
| Alint           |       | 323     | thinleaf alder/                |
| Alint-Befo/SALI |       | 32301   | river birch/willow             |
| Alint-Begl/Caaq |       | 32302   | bog birch/water sedge          |
| Alint-Sadr/Eqar |       | 32303   | Drummond willow/horsetail      |
| Alint/Swse      |       | 32304   | redosier dogwood               |
| AMEL            |       | 301     | serviceberry/                  |
| AMEL/Cagel      |       | 30102   | elk sedge                      |
| AMEL-Putr/Rosp  |       | 30104   | bitterbrush/bluebunch whtgr.   |
| AMEL/Syorl-Artr |       | 30101   | mountain snowberry-sagebrush   |
|                 | Rosp  | 30101-1 | bluebunch wheatgrass           |
|                 | Stle  | 30101-2 | Letterman needlegrass          |
|                 | Feth  | 30101-3 | Thurber fescue                 |
| Amal-Pavi/Viam  |       | 30103   | chokecherry/American vetch     |
| Arar3           |       | 304     | low sagebrush/                 |
| Arar3/Feid      |       | 30403   | Idaho fescue                   |
| Arar3/Rosp      |       | 30401   | bluebunch wheatgrass           |
| Arca3           |       | 302     | silver sagebrush/              |
| Arca3/Elsm      | Elsm  | 30201-0 | western wheatgrass             |
|                 | Stvi  | 30201-1 | green needlegrass              |
| Arca3-Syoc/Elsm | Elsm  | 30204-0 | snowberry/western wheatgrass   |
|                 | Bogr  | 30204-1 | blue grama                     |
| Arca3/Feid      |       | 30202   | Idaho fescue                   |
| Arca3/Feth      |       | 30203   | Thurber fescue                 |
| Arfi            |       | 303     | sand sagebrush/                |
| Arfi/Anha       |       | 30301   | sand bluestem                  |
| Arfi/Spcr-Bogr  |       | 30302   | sand dropseed-blue grama       |
| Arlo3           |       | 318     | alkali sagebrush/              |
| Arlo3/Elsm      |       | 31801   | western wheatgrass             |
| Arlo3/Rosp      |       | 31802   | bluebunch wheatgrass           |
| Arno            |       | 317     | black sagebrush/               |
| Arno/Basa2      |       | 31702   | arrowleaf balsamroot           |
| Arno/Rosp       |       | 31701   | bluebunch wheatgrass           |
| Artr            |       | 305     | big sagebrush/                 |
| Artr/Bogr       | Bogr  | 30519-0 | blue grama                     |
|                 | Hija  | 30519-1 | alkali sacaton                 |
| Artr/Chna       |       | 30503   | rubber rabbitbrush             |
| Artr-Putr/Elda  |       | 30509   | bitterbrush/thickspike whtgr.  |
| Artr-Putr/Elsm  |       | 30514   | bitterbrush/western wheatgrass |
| Artr/Elsm       | Elsm  | 30517-0 | western wheatgrass             |
|                 | Mucu  | 30517-1 | plains muhly                   |
|                 | Bogr  | 30517-2 | blue grama                     |

|                  |       |         |                               |
|------------------|-------|---------|-------------------------------|
| Artrr/Feid       | Feid  | 30506-0 | Idaho fescue                  |
|                  | Gevi  | 30506-1 | sticky geranium               |
| Artrr/Feth       |       | 30507   | Thurber fescue                |
| Artrr/Leam       |       | 30504   | Colorado wildrye              |
| Artrr/Leci       |       | 30505   | Pacific giant wildrye         |
| Artrr-Syor1/Leci |       | 30518   | snowberry/giant wildrye       |
| Artrr/Leki       |       | 30508   | spike-fescue                  |
| Artrr-Chvi3/LUPI |       | 30515   | Douglas rabbitbrush/lupine    |
| Artrr/Orhy       | Orhy  | 30510-0 | Indian ricegrass              |
|                  | Syor1 | 30510-1 | mountain snowberry            |
| Artrr/Rosp       |       | 30502   | bluebunch wheatgrass          |
| Artrr/Spcr       |       | 30519   | sand dropseed                 |
| Artrr/Stcol      |       | 30512   | needle-and-thread             |
| Artrr/Stnel      |       | 30511   | Letterman needlegrass         |
| Artrl            |       | 306     | threetip sagebrush/           |
| Artrl/Feid       |       | 30601   | Idaho fescue                  |
| Artrl/Pose       |       | 30603   | Sandberg bluegrass            |
| Artrl/Stcol      |       | 30604   | needle-and-thread             |
| ATRI             |       | 324     | saltbush/                     |
| Atca/Bogr        |       | 32401   | fourwing/blue grama           |
| Atca/Elsm-Bogr   |       | 32405   | fourwing/wstrn whtgrs-grama   |
| Atca-Artrr/Elsm  |       | 32406   | fourwing-sagebrush/wheatgrass |
| Atca-Atco/Spai   |       | 32402   | fourwng-shadsc/alkali sacaton |
| Atca/Stcol       |       | 32404   | fourwing/needle-and-thread    |
| Atco-Artrr/Rosp  |       | 32403   | shadscale-sagebr/wheatgrass   |
| Atga/Elsm        |       | 32407   | Gardner saltbush/wheatgrass   |
| Begl             |       | 329     | bog birch/                    |
| Begl/Casc2       |       | 32901   | "cliff" sedge                 |
| Begl/Popul       |       | 32902   | skunkleaf polemonium          |
| Cele             |       | 307     | curlleaf mountain-mahogany/   |
| Cele/Rosp        |       | 30701   | bluebunch wheatgrass          |
| Cemo             |       | 308     | mountain-mahogany/            |
| Cemo-Rhart/Ange  |       | 30808   | skunkbrush/big bluestem       |
| Cemo-Rhart/Bocu  |       | 30804   | skunkbrush/sideoats grama     |
| Cemo/Elda        |       | 30801   | thickspike wheatgrass         |
| Cemo/Feid        |       | 30803   | Idaho fescue                  |
| Cemo/Mumol       |       | 30807   | mountain muhly                |
| Cemo/Rosp        |       | 30802   | bluebunch wheatgrass          |
| Cemo/Stcol       | Stcol | 30805-0 | needle-and-thread             |
|                  | Rhart | 30805-1 | skunkbrush                    |
| Cemo/Stle        |       | 30806   | Letterman needlegrass         |
| Diin             |       | 331     | twinberry/                    |
| Diin/Caca        |       | 33101   | bluejoint reedgrass           |
| Droc             |       | 310     | dryad/                        |
| Droc/Caru        | Caru  | 31002-0 | sedge                         |
|                  | Libi  | 31002-1 | alpine sandwort               |
| Droc/Saren       |       | 31003   | snow willow                   |
| Eula             |       | 335     | winterfat/                    |
| Eula/Hija        |       | 33501   | galleta                       |
| Hodu             |       | 333     | ocean-spray/                  |
| Hodu/Feth        |       | 33301   | Thurber fescue                |
| Hodu/Rice        |       | 33302   | wax currant                   |
| Juco             |       | 332     | common juniper/               |
| Juco-RIBE/Feth   |       | 33201   | currant/Thurber fescue        |
| Juho             |       | 325     | low juniper/                  |
| Juho/Cahe1       | Cahe1 | 32502-0 | sun sedge                     |
|                  | Rosp  | 32502-1 | bluebunch wheatgrass          |



|                     |       |         |                                |
|---------------------|-------|---------|--------------------------------|
| Juho/Scsc           | Scsc  | 32501-0 | little bluestem                |
|                     | Pefl  | 32501-1 | shrubby cinquefoil             |
| Pavi                |       | 327     | chokecherry/                   |
| Pavi-Syoc/Elsm      |       | 32701   | snowberry/western wheatgrass   |
| Pavi-Syorl/Eltr     |       | 32702   | snowberry/slender wheatgrass   |
| Pefl                |       | 311     | shrubby cinquefoil/            |
| Pefl/Ciau           |       | 31105   | yellowdot saxifrage            |
| Pefl/Dece           |       | 31104   | tufted hairgrass               |
| Pefl/Feid           |       | 31101   | Idaho fescue                   |
| Pefl/Fesc           |       | 31103   | rough fescue                   |
| Pefl/Feth           |       | 31102   | Thurber fescue                 |
| Pera2               |       | 334     | squaw-apple/                   |
| Pera2-Syorl/Mare    |       | 33401   | mtn. snowberry/Oregon-grape    |
| Putr                |       | 312     | bitterbrush/                   |
| Putr-Artr/Feid      |       | 31201   | sagebrush/Idaho fescue         |
| Putr/Mumol          |       | 31202   | mountain muhly                 |
| Putr-Artr/Rosp      |       | 31205   | sagebrush/bluebunch wheatgrass |
| Putr/Rosp           |       | 31204   | bluebunch wheatgrass           |
| Putr/Stcol          |       | 31203   | needle-and-thread              |
| Quga                |       | 313     | Gambel oak/                    |
| Quga/Amal           | Amal  | 31301-0 | Saskatoon serviceberry         |
|                     | Mare  | 31301-1 | Oregon-grape                   |
| Quga/Amut           |       | 31302   | Utah serviceberry              |
| Quga/Cahel          |       | 31306   | sun sedge                      |
| Quga/Cemo           |       | 31303   | mountain-mahogany              |
| Quga-Pavi/Feth      |       | 31307   | Thurber fescue                 |
| Quga-Pavi/Pamy      | Pamy  | 31304-0 | chokecherry/myrtle pachistima  |
|                     | Swse  | 31304-3 | redosier dogwood               |
| Quga/Syorl          | Syorl | 31305-0 | mountain snowberry             |
|                     | Cemo  | 31305-4 | mountain-mahogany              |
|                     | Artr  | 31305-5 | big sagebrush                  |
| Rhart               |       | 319     | skunkbrush/                    |
| Rhart/Cafi          |       | 31903   | threadleaf sedge               |
| Rhart/Mumol         |       | 31904   | mountain muhly                 |
| Rhart/Rosp          | Rosp  | 31901-0 | bluebunch wheatgrass           |
|                     | Feid  | 31901-1 | Idaho fescue                   |
| Rhart/Spr           |       | 31902   | sand dropseed,                 |
| RIBE                |       | 320     | currant/                       |
| Rice/Feid           |       | 32003   | wax currant/Idaho fescue       |
| Rimo/Aqco           |       | 32001   | gooseberry currant/columbine   |
| Rimo/Popul          |       | 32002   | skunkleaf polemonium           |
| RUBU                |       | 321     | raspberry/                     |
| Ruid/Aqco           |       | 32101   | Colorado columbine             |
| Ruid/Hepa2          |       | 32102   | alumroot                       |
| SALI                |       | 314     | willow/                        |
| Saam-Saphp/Ashe     |       | 31411   | peachleaf-planeleaf/aster      |
| Sab01-SALI/Caca     |       | 31418   | Booth/bluejoint reedgrass      |
| Sab01-SALI/Caut     |       | 31417   | Booth willow/beaked sedge      |
| Saca6-SALI/Caaq     |       | 31427   | willow/water sedge             |
| Sadr/Caca           |       | 31426   | Drummond/bluejoint reedgrass   |
| Saex-SALI/Caca-Eqar |       | 31424   | coyote/bluejoint-horsetail     |
| Saex-SALI/POA       |       | 31412   | coyote willow/bluegrass        |
| Sage-SALI/Caca      | Caca  | 31402-0 | Geyer/bluejoint reedgrass      |
|                     | Dece  | 31402-1 | tufted hairgrass               |
| Sage-SALI/Caut      |       | 31413   | Geyer willow/beaked sedge      |
| Sage/Popa           |       | 31416   | Geyer willow/fowl bluegrass    |
| Sag11/Acro          |       | 31415   | grayleaf willow/golden avens   |

|                  |       |         |                               |
|------------------|-------|---------|-------------------------------|
| Sagl1-SALI/CARE  |       | 31409   | grayleaf willow/sedge         |
| Sagl1-Sabrl/Dece | Dece  | 31408-0 | grayleaf-barrengrnd/hairgrass |
|                  | Popul | 31408-1 | skunkleaf polemonium          |
| Salu/Eqar        |       | 31425   | yellow willow/field horsetail |
| Sapel/Thpal      |       | 31404   | meadow willow/marshfern       |
| Saphp/Cale1      |       | 31401   | planeleaf/marsh-marigold      |
| Saphp/Caaq       | Caaq  | 31405-0 | planeleaf willow/water sedge  |
|                  | Dece  | 31405-1 | tufted hairgrass              |
| Saphp/Casc2      |       | 31406   | planeleaf/"cliff" sedge       |
| Saphp/Dece       |       | 31414   | planeleaf/tufted hairgrass    |
| Sawo/Caca        |       | 31421   | Wolfs/bluejoint reedgrass     |
| Sawo/Caaq        |       | 31419   | Wolfs willow/water sedge      |
| Sawo/Caut        |       | 31420   | Wolfs willow/beaked sedge     |
| Sawo/Dece        |       | 31422   | Wolfs willow/tufted hairgrass |
| Sawo/Frvi        |       | 31423   | Wolfs willow/strawberry       |
| Save2            |       | 315     | greasewood/                   |
| Save2-Atco/Eltr  |       | 31507   | shadscale/slender wheatgrass  |
| Save2-Artr/Elsm  |       | 31501   | sagebrush/western wheatgrass  |
| Save2/Leci       |       | 31505   | Pacific giant wildrye         |
| Save2-Atga/Pose  |       | 31502   | Gardner saltbush/bluegrass    |
| Save2/Rosp       |       | 31506   | bluebunch wheatgrass          |
| Save2/Spai       |       | 31504   | alkali sacaton                |
| Swse             |       | 328     | red-osier dogwood/            |
| Swse/Diin        |       | 32802   | twinberry                     |
| Swse/Hesp        |       | 32801   | cow-parsnip                   |
| Swse/Riin        |       | 32803   | unarmed currant               |
| Syoc             |       | 326     | western snowberry/            |
| Syoc/Elsm        |       | 32601   | western wheatgrass            |
| Syor1            |       | 316     | mountain snowberry/           |
| Syor1/Feth       |       | 31601   | Thurber fescue                |
| VACC             |       | 322     | whortleberry/                 |
| Vace/Bltr        |       | 32202   | pine dropseed                 |
| Vasc-Vace/Libi   |       | 32201   | alpine sandwort               |
| G                |       | 4       | GRASSLANDS                    |
| Ange             |       | 403     | big bluestem/                 |
| Ange/Diols       |       | 40304   | Scribner panicum              |
| Ange/Scsc        |       | 40301   | little bluestem               |
| Ange/Soav        | Soav  | 40302-0 | yellow Indiangrass            |
|                  | Sppe  | 40302-1 | cordgrass                     |
|                  | Spai  | 40302-2 | alkali sacaton                |
| Ange/Sphe        |       | 40303   | prairie dropseed              |
| Anha             |       | 404     | sand bluestem/                |
| Anha/Calo        | Calo  | 40401-0 | prairie sandreed              |
|                  | Stcol | 40401-1 | needle-and-thread             |
|                  | Ertr  | 40401-2 | sand lovegrass                |
|                  | Scsc  | 40401-3 | little bluestem               |
| Bocu             |       | 406     | sideoats grama/               |
| Bocu/Scsc        | Scsc  | 40601   | little bluestem               |
| Bogr             |       | 407     | blue grama/                   |
| Bogr/Atca        |       | 40704   | fourwing saltbush             |
| Bogr/Bocu        | Bocu  | 40708-0 | sideoats grama                |
|                  | Spai  | 40708-1 | alkali sacaton                |
| Bogr/Buda        |       | 40705   | buffalo grass                 |
| Bogr/Cae11       |       | 40712   | needleleaf sedge              |
| Bogr/Cae1        |       | 40706   | sun sedge                     |
| Bogr/Elsm        | Elsm  | 40701-0 | western wheatgrass            |
|                  | Buda  | 40701-2 | buffalograss                  |

|                 |       |         |                               |
|-----------------|-------|---------|-------------------------------|
| Bogr/Eulal      |       | 40707   | winterfat                     |
| Bogr/Hija       | Hija  | 40713-0 | galleta                       |
|                 | Boer  | 40713-1 | hairy grama                   |
| Bogr/Mufil      | Mufil | 40709-0 | slimstem muhly                |
|                 | Chna  | 40709-1 | rubber rabbitbrush            |
|                 | Chpa3 | 40709-2 | Parry rabbitbrush             |
| Bogr/STIP       |       | 40710   | needlegrass                   |
| Bogr/Stcol      | Stcol | 40711-0 | needle-and-thread             |
|                 | Calo  | 40711-1 | prairie sandreed              |
|                 | Cahe1 | 40711-2 | sun sedge                     |
|                 | Stvi  | 40711-3 | green needlegrass             |
| Buda            |       | 409     | buffalo grass/                |
| Buda/CARE       |       | 40902   | sedge spp.                    |
| Buda/E1sm       |       | 40901   | western wheatgrass            |
| Caca            |       | 410     | bluejoint reedgrass/          |
| Caca/Casa2      |       | 41001   | Sartwell sedge                |
| Caca-Casc2/Meci |       | 41002   | "cliff" sedge/mtn. bluebells  |
| Capu            |       | 439     | purple pinegrass/             |
| Capu/Hemo       |       | 43901   | alpine oat                    |
| Capu/Pog1       |       | 43902   | Greenland bluegrass           |
| Calo            |       | 411     | prairie sandreed/             |
| Calo/Bogr       |       | 41104   | blue grama                    |
| Calo/Cahe1      |       | 41105   | sun sedge                     |
| Calo/Spcr       |       | 41103   | sand dropseed                 |
| Calo/Stcol      | Stcol | 41102-0 | needle-and-thread             |
|                 | Bogr  | 41102-1 | blue grama                    |
| CARE            |       | 412     | sedge/                        |
| Caaq/Caho1      |       | 41230   | water sedge/Hood sedge        |
| Caaq/Caut       | Caut  | 41201-0 | water sedge/beaked sedge      |
|                 | Elqu  | 41201-1 | spike-sedge                   |
|                 | Caaq  | 41201-2 | water sedge                   |
| Caaq/Pegr1      |       | 41206   | water sedge/elephant-head     |
| Caar3/Libi      |       | 41207   | Arapaho sedge/alpine sandwort |
| Caca3/Bivi      |       | 41208   | sedge/viviparous bistort      |
| Cael/Acro       |       | 41227   | elynoides sedge/golden avens  |
| Cael/OREO       |       | 41209   | elynoides sedge/oreoxis       |
| Cael/Sede       |       | 41226   | elynoides sedge/selaginella   |
| Cael/Trda       |       | 41202   | elynoides sedge/whiprt clover |
| Caen/Saren      |       | 41228   | Engelmann sedge/snow willow   |
| Cafo/Acro       |       | 41210   | silvertop sedge/golden avens  |
| Caha/Poar2      | Poar2 | 41211-0 | cloud sedge/arctic bluegrass  |
|                 | Podi  | 41211-2 | varileaf cinquefoil           |
| Cami3/Bivi      |       | 41212   | sedge/viviparous bistort      |
| Cami4/Dece      |       | 41231   | smallwing sedge/hairgrass     |
| Cana/Beal       |       | 41224   | nardina sedge/kittentails     |
| Cane/Caaq1-Juar |       | 41215   | Nebraska/brookgrass-rush      |
| Cane/Dece       |       | 41220   | Nebraska sedge/hairgrass      |
| Cani/JUNC       |       | 41213   | black alpine sedge/rush spp.  |
| Capel/Siac      |       | 41214   | Mt. Baldy sedge/moss campion  |
| Capr1/Caaq      | Caaq  | 41229-0 | teachers' sedge/water sedge   |
|                 | Elqu  | 41229-1 | spike-sedge                   |
| Capy/Erme       |       | 41216   | pyrenaica sedge/fleabane      |
| Capy/moss       |       | 41218   | pyrenaica sedge/moss          |
| Caru/Komy       |       | 41225   | sedge/kobresia                |
| Caru/Libi       |       | 41203   | sedge/alpine sandwort         |
| Caru/Phsi       |       | 41221   | sedge/alpine phlox            |
| Caru/Trda       |       | 41204   | sedge/whiproot clover         |

|                |       |         |                              |
|----------------|-------|---------|------------------------------|
| Casc2/Acro     |       | 41217   | "cliff" sedge/golden avens   |
| Casc2/Bivi     |       | 41232   | "cliff" sedge/vivip. bistort |
| Casc2/Cale1    | Cale1 | 41205-0 | "cliff" sedge/marsh-marigold |
|                | Rhin  | 41205-1 | kingscrown                   |
| Casc2/Dece     |       | 41222   | "cliff" sedge/hairgrass      |
| Casc2/moss     |       | 41223   | "cliff" sedge/moss           |
| Casi/Dece      |       | 41219   | sedge/tufted hairgrass       |
| Caaq1          |       | 440     | brookgrass/                  |
| Caaq1/Caaq     |       | 44001   | water sedge                  |
| Dain           |       | 413     | timber oatgrass/             |
| Dain/Dece      | Dece  | 41302-0 | tufted hairgrass             |
|                | Oral  | 41302-1 | alpine oreoxis               |
| Dain/Podi      | Podi  | 41301-0 | varileaf cinquefoil          |
|                | Sipr  | 41301-1 | sibbaldia-sagewort           |
| Dain/Stle      |       | 41303   | Letterman needlegrass        |
| Dapa1          |       | 414     | Parry oatgrass               |
| Dapa1/Cahel    | Cahel | 41402-0 | sun sedge                    |
|                | Scsc  | 41402-1 | little bluestem              |
| Dapa1/Fear1    |       | 41403   | Arizona fescue               |
| Dapa1/Feid     |       | 41401   | Idaho fescue                 |
| Dece           |       | 415     | tufted hairgrass/            |
| Dece/Acro      | Acro  | 41503   | golden avens                 |
| Dece/Cale1     | Cale1 | 41501-0 | marsh-marigold               |
|                | Raal  | 41501-1 | plantain-leaf buttercup      |
| Dece/CARE      | Cane  | 41502-0 | Nebraska sedge               |
|                | Caaq  | 41502-1 | water sedge                  |
|                | Ca11  | 41502-2 | sheep sedge-bistort          |
| Dece/Eltr      |       | 41505   | slender wheatgrass           |
| Dece/Judr      |       | 41504   | Drummond rush                |
| Disp           |       | 416     | inland saltgrass/            |
| Disp/Elsm      |       | 41601   | western wheatgrass           |
| Disp/Puai      |       | 41602   | Nuttall alkaligrass          |
| Disp/Spai-Elsm | Spai  | 41603-0 | sand dropseed-wheatgrass     |
|                | Sude  | 41603-1 | Pursh seepweed               |
| ELEO           |       | 417     | spikesedge/                  |
| Elpa/CARE      |       | 41701   | sedge                        |
| Elsm           |       | 401     | western wheatgrass/          |
| Elsm/Bogr      | Bogr  | 40101-0 | blue grama                   |
|                | Stcol | 40101-1 | needle-and-thread            |
|                | Stvi  | 40101-2 | green needlegrass            |
| Elsm/Cafi      |       | 40106   | threadleaf sedge             |
| Elsm/Cahel     |       | 40105   | sun sedge                    |
| Elsm/Disp      |       | 40102   | inland saltgrass             |
| Elsm/Elac      |       | 40103   | needle spikesedge            |
| Elsm/Stvi      |       | 40104   | green needlegrass            |
| Fear1          |       | 419     | Arizona fescue/              |
| Fear1/Cahel    |       | 41903   | sun sedge                    |
| Fear1/Mumol    |       | 41902   | mountain muhly               |
| Feid           |       | 420     | Idaho fescue/                |
| Feid/Cahel     |       | 42013   | sun sedge                    |
| Feid/Caob      |       | 42002   | sedge                        |
| Feid/Dece      |       | 42011   | tufted hairgrass             |
| Feid/Elsm      |       | 42001   | western wheatgrass           |
| Feid/Eltr      | Eltr  | 42008-0 | slender wheatgrass           |
|                | Ipag  | 42008-1 | skyrocket gilia              |
| Feid/Gevi      |       | 42003   | sticky geranium              |
| Feid/Leki      |       | 42004   | spike-fescue                 |

|                |       |         |                               |
|----------------|-------|---------|-------------------------------|
| Feid/Luse      |       | 42005   | silky lupine                  |
| Feid/Rosp      | Rosp  | 42010-0 | bluebunch wheatgrass          |
|                | Stnel | 42010-1 | Columbia needlegrass          |
| Feid/Trsp      |       | 42012   | spike trisetum                |
| Fesc           |       | 435     | rough fescue/                 |
| Fesc/Feid      |       | 43501   | Idaho fescue                  |
| Feth           |       | 422     | Thurber fescue/               |
| Feth/Dapal     |       | 42204   | Parry oatgrass                |
| Feth/Fearl     |       | 42203   | Arizona fescue                |
| Feth/Feid      |       | 42201   | Idaho fescue                  |
| Feth/Oral      |       | 42205   | alpine oreoxis                |
| Feth/Viam-Lale |       | 42202   | American vetch-aspen peavine  |
| Hija           |       | 441     | galleta/                      |
| Hija/Spai      |       | 44101   | alkali sacaton                |
| JUNC           |       | 423     | rush/                         |
| Juar/CARE      | CARE  | 42301-0 | Baltic rush/sedge             |
|                | Cane  | 42301-1 | Nebraska sedge                |
|                | Dece  | 42301-2 | tufted hairgrass              |
| Juar/Disp      |       | 42304   | Baltic rush/saltgrass         |
| Judr/CARE      |       | 42302   | Drummond rush/sedge           |
| Judr/Sipr      |       | 42303   | Drummond rush/sibbaldia       |
| KOBR           |       | 424     | kobresia/                     |
| Komy/Acro-Caru |       | 42401   | golden avens-sedge            |
| Komy/Trda      | Trda  | 42402-0 | whiproot clover               |
|                | Oral  | 42402-1 | alpine oreoxis                |
| Komy/Trna      |       | 42403   | dwarf clover                  |
| Kosi/Bivi      |       | 42404   | viviparous bistort            |
| Leam           |       | 418     | Colorado wildrye/             |
| Leam/Rice      |       | 41801   | wax currant                   |
| Mucu           |       | 434     | stonyhills muhly/             |
| Mucu/Scsc      |       | 43401   | little bluestem               |
| Mufil          |       | 425     | slimstem muhly/               |
| Mufil/Arfrl    |       | 42501   | fringed sage                  |
| Mumol          |       | 426     | mountain muhly/               |
| Mumol/Bltr     |       | 42601   | pine dropseed                 |
| Mumol/Elda     |       | 42603   | thickspike wheatgrass         |
| Mumol/Fearl    |       | 42602   | Arizona fescue                |
| Mumol/Mela     |       | 42604   | lanceleaf bluebells           |
| Phco           |       | 427     | reed/                         |
| Phco/Calal     |       | 42701   | lake sedge                    |
| POA            |       | 428     | bluegrass/                    |
| Poar2/Bivi     |       | 42803   | arctic bluegrass/bistort      |
| Pone2/Stle     |       | 42801   | Wheeler/Letterman needlegrass |
| Puai           |       | 437     | Nuttall alkali-grass/         |
| Puai/Trma      |       | 43701   | shore podgrass                |
| Rosp           |       | 402     | bluebunch wheatgrass/         |
| Rosp/Bocu      |       | 40209   | sideoats grama                |
| Rosp/Bogr      |       | 40208   | blue grama                    |
| Rosp/Cafi      |       | 40210   | threadleaf sedge              |
| Rosp/Elsm      |       | 40207   | western wheatgrass            |
| Rosp/Pofe      |       | 40206   | muttongrass                   |
| Rosp/Pose      |       | 40204   | Sandberg bluegrass            |
| Rosp/Stcol     |       | 40211   | needle-and-thread             |
| Scsc           |       | 405     | little bluestem/              |
| Scsc/Bocu      |       | 40501   | sideoats grama                |
| Scsc/Bogr      |       | 40502   | blue grama                    |
| Scsc/Bohi      |       | 40504   | hairy grama                   |



|                 |       |         |                              |
|-----------------|-------|---------|------------------------------|
| Scsc/Cafi       | Cafi  | 40503-0 | threadleaf sedge             |
| Scsc/STIP       | Stcol | 40503-1 | needle-and-thread            |
| SCIR            |       | 40505   | needlegrass spp.             |
| Scam/CARE       |       | 433     | bulrush/                     |
| SCIR/Disp       | Disp  | 43301   | American bulrush/sedge       |
|                 | Sppe1 | 43302-0 | alkali bulrush/saltgrass     |
|                 |       | 43302-1 | prairie cordgrass            |
| Sppe1           |       | 438     | prairie cordgrass/           |
| Sppe1/Caca      |       | 43801   | bluejoint reedgrass          |
| Spai            |       | 429     | alkali sacaton/              |
| Spai/Bogr       |       | 42902   | blue grama                   |
| Spai/Eism       |       | 42901   | western wheatgrass           |
| Spas            |       | 430     | tall dropseed/               |
| Spas/Scsc       |       | 43001   | little bluestem              |
| Sphe            |       | 432     | prairie dropseed/            |
| Sphe/CARE       |       | 43201   | sedge                        |
| Sphe/Stsp       |       | 43202   | porcupine grass              |
| Stcol           |       | 431     | needle-and-thread/           |
| Stcol/Bogr      | Bogr  | 43103-0 | blue grama                   |
|                 | Bocu  | 43103-1 | sideoats grama               |
|                 | Stsp  | 43103-2 | porcupine grass              |
| Stcol/Bohi      |       | 43108   | hairy grama                  |
| Stcol/Caeb      |       | 43110   | ebony sedge                  |
| Stcol/Cael1     |       | 43107   | needleleaf sedge             |
| Stcol/Cafi      |       | 43104   | threadleaf sedge             |
| Stcol/Cahe1     | Cahe1 | 43109-0 | sun sedge                    |
|                 | Sede  | 43109-1 | selaginella                  |
|                 | Stvi  | 43109-2 | green needlegrass            |
| Stcol/Elda      |       | 43102   | thickspike wheatgrass        |
| Stcol/Mumo1     |       | 43106   | mountain muhly               |
| Stsp            |       | 436     | porcupine grass/             |
| Stsp/Ange       | Ange  | 43602-0 | big bluestem                 |
|                 | Scsc  | 43602-1 | little bluestem              |
| Stsp/Mucu       |       | 43601   | plains muhly                 |
| F               |       | 5       | FORBLANDS                    |
| Acro            |       | 502     | golden avens/                |
| Acro/Bibi2      |       | 50205   | alpine bistort               |
| Acro/Caru       |       | 50208   | sedge                        |
| Acro/Poar2      |       | 50201   | arctic bluegrass             |
| Acro/Trda       |       | 50206   | whiproot clover              |
| Acro/Trna       |       | 50207   | dwarf clover                 |
| Acro/TRIF-Dece  |       | 50203   | clover-tufted hairgrass      |
| Anme            |       | 509     | alpine pussytoes/            |
| Anme/Poar2      |       | 50901   | arctic bluegrass             |
| Arar4           |       | 510     | arctic sage/                 |
| Arar4/Trpa-Libi |       | 51001   | Parry clover-alpine sandwort |
| Cale1           |       | 511     | marsh-marigold/              |
| Cale1/Clrh      |       | 51101   | kingscrown                   |
| Caco2           |       | 512     | heartleaf bittercress/       |
| Caco2/Cale1     |       | 51201   | marsh-marigold               |
| Cisc            |       | 513     | alpine thistle/              |
| Cisc/Aqco       |       | 51301   | Colorado columbine           |
| Cime            |       | 501     | alpine springbeauty/         |
| Cime/Sasa       |       | 50101   | arctic pearlwort             |
| Cime/Siac       |       | 50102   | moss campion                 |
| ERIO            |       | 528     | buckwheat/                   |
| Erco3/Oxde      |       | 52801   | dropped crazyweed            |

|                  |       |         |                               |
|------------------|-------|---------|-------------------------------|
| HEUC             |       | 514     | alumroot/                     |
| Hebr-Hepa2/Erpi2 |       | 51401   | pinnafe fleabane              |
| Ivgo             |       | 529     | Gordon ivesia/                |
| Ivgo/Erfe        |       | 52901   |                               |
| Lipo             |       | 503     | Porter ligusticum/            |
| Lipo/Lupa3       |       | 50301   | lodgpole lupine               |
| Lipo/Viam        |       | 50302   | American vetch                |
| Meci             |       | 515     | mountain bluebells/           |
| Meci/Dece        |       | 51501   | tufted hairgrass              |
| OREO             |       | 523     | oreoxis/                      |
| Orba/Saar-Sede   |       | 52301   | Arctic willow-selaginella     |
| Papu             |       | 504     | Rocky Mountain nailwort/      |
| Papu/Libi        |       | 50401   | alpine sandwort               |
| PHLO             |       | 525     | phlox/                        |
| Phsi/Trda        |       | 52501   | alpine phlox/whiproot clover  |
| PHYS             |       | 526     | double bladder-pod/           |
| Phal/Peha        |       | 52601   | Harrington beardtongue        |
| Povi             |       | 516     | sticky polemonium/            |
| Povi/Erpi        |       | 51602   | pinnafe fleabane              |
| Povi/Phse-Cisc   |       | 51601   | phacelia-alpine thistle       |
| Prpa2            |       | 517     | Parry primrose/               |
| Prpa2/Dece       |       | 51701   | tufted hairgrass              |
| SALI             |       | 505     | forb willow/                  |
| Saar/Acro        | Acro  | 50501-0 | arctic willow/golden avens    |
|                  | Sipr  | 50501-1 | sibbaldia                     |
|                  | Casc2 | 50501-2 | "cliff" sedge                 |
| Saar/Erme        |       | 50503   | arctic willow/fleabane        |
| Saar/Trpa        |       | 50505   | arctic willow/Parry clover    |
| Saren/Acro       |       | 50502   | snow willow/golden avens      |
| Saren/Vace       |       | 50504   | snow willow/dwarf blueberry   |
| SAXI             |       | 518     | saxifrage/                    |
| Ciau/Cyfr        |       | 51803   | yellowdot saxif/brittle fern  |
| Saod/Dece        |       | 51801   | tufted hairgrass              |
| Sase/Febr        |       | 51802   | sheep fescue                  |
| SENE             |       | 519     | groundsel/                    |
| Seat/Phhe        |       | 51902   | black gr./phacelia            |
| Setr/Lifi        |       | 51901   | arrowleaf gr./ligusticum      |
| Sipr             |       | 520     | sibbaldia/                    |
| Sipr/Caeb        |       | 52004   | ebony sedge                   |
| Sipr/Capy        |       | 52002   | sedge                         |
| Sipr/Libi-moss   | Libi  | 52001-0 | alpine sandwort-moss          |
|                  | Poar2 | 52001-1 | arctic bluegrass              |
| Smca             |       | 527     | smelowskia/                   |
| Smca/Arbo        |       | 52701   | alpine sagewort               |
| SUAE             |       | 522     | seepweed/                     |
| SUAE/Saru        | Saru  | 52201-0 | Rocky Mountain glasswort      |
|                  | Puai  | 52201-1 | Nuttall alkaligrass           |
|                  | Seve  | 52201-2 | sea-blite                     |
| TRIF             |       | 506     | clover/                       |
| Trda/Caru        |       | 50602   | whiproot clover/sedge         |
| Trda/Elsc        |       | 50601   | whiproot/Scribner wheatgrass  |
| Trda/Libi        |       | 50606   | whiproot/alpine sandwort      |
| Trna/Erpi2       |       | 50607   | dwarf clover/pinnafe fleabane |
| Trna/Libi        | Libi  | 50603-0 | dwarf clover/alpine sandwort  |
|                  | Papu  | 50603-1 | Rocky Mtn. nailwort           |
| Trpa/Acro        |       | 50604   | Parry clover/golden avens     |
| Trpa/Dece        |       | 50608   | Parry clover/tufted hairgrass |

|                 |       |                               |
|-----------------|-------|-------------------------------|
| Trpa/Raad       | 50605 | Parry clover/alpine buttercup |
| Tral            | 521   | globeflower/                  |
| Tral-Lifi/Erpei | 52101 | fernleaf ligusticum/fleabane  |
| Tyla            | 507   | common cattail/               |
| Tyla/Sala       | 50701 | common arrowhead              |
| Vaca2           | 508   | sharp-leaf valerian/          |
| Vaca2/Cebe2     | 50801 | Bering cerastium              |
| Vete            | 524   | false-hellebore/              |
| Vete/Hesp       | 52401 | cow-parsnip                   |

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a. Alphabetic plant association abbreviations are based on plant species abbreviations shown in Appendix 2.

b. Plant species abbreviations and common names have been adapted from Nickerson, M. F., G. E. Brink, and C. Feddema (1976). Principal range plants of the central and southern Rocky Mountains. USDA Forest Service Genl. Tech. Rept. RM-20, 121 pp.

c. Phase names and numbers are from the text of this book. The typical phase is always named for the species appearing after the slash in the plant association name, and always is numbered zero. If phases have not been defined, or if the phase is unknown, code the phase as blank.

# APPENDIX 2. LIST OF PLANT SPECIES CITED

## I. TREES AND SHRUBS

|       |                                                      |         |                           |
|-------|------------------------------------------------------|---------|---------------------------|
| Abar  | <i>Abies arizonica</i>                               | OK      | corkbark fir              |
|       | <i>Abies bifolia</i>                                 | = Abia  |                           |
| Abco  | <i>Abies concolor</i>                                | OK      | white fir                 |
| Abla  | <i>Abies lasiocarpa</i>                              | OK      | subalpine fir             |
|       | <i>Abies lasiocarpa</i> var. <i>arizonica</i>        | = Abar  |                           |
| Acgl  | <i>Acer glabrum</i>                                  | OK      | Rocky Mtn. maple          |
| Acne  | <i>Acer negundo</i>                                  | OK      | box-elder                 |
| Alin1 | <i>Alnus incana</i>                                  | OK      | thinleaf alder            |
| Alint | <i>Alnus incana</i> ssp. <i>tenuifolia</i>           | OK      | thinleaf alder            |
| Alsi  | <i>Alnus sinuata</i>                                 | OK      | wavyleaf alder            |
|       | <i>Alnus tenuifolia</i>                              | = Alint |                           |
| Amal  | <i>Amelanchier alnifolia</i>                         | OK      | Saskatoon serviceberry    |
| Amut  | <i>Amelanchier utahensis</i>                         | OK      | Utah serviceberry         |
| Amcal | <i>Amorpha canescens</i>                             | OK      | leadplant                 |
| Amfr1 | <i>Amorpha fruticosa</i>                             | OK      | indigo-bush               |
| Amna  | <i>Amorpha nana</i>                                  | OK      | dwarf indigobush          |
| Aram  | <i>Arceuthobium americanum</i>                       | OK      | lodgepole dwarf-mistletoe |
| Arad1 | <i>Arctostaphylos adenotricha</i>                    | OK      | kinnikinnick              |
| Arpa3 | <i>Arctostaphylos patula</i>                         | OK      | greenleaf manzanita       |
|       | <i>Arctostaphylos uva-ursi</i>                       | = Arad  |                           |
| Arar3 | <i>Artemisia arbuscula</i>                           | OK      | low sagebrush             |
| Arca3 | <i>Artemisia cana</i>                                | OK      | silver sagebrush          |
| Arfi  | <i>Artemisia filifolia</i>                           | OK      | sand sagebrush            |
| Arfr1 | <i>Artemisia frigida</i>                             | OK      | fringed sage              |
| Arlo3 | <i>Artemisia longiloba</i>                           | OK      | alkali sagebrush          |
| Arno  | <i>Artemisia nova</i>                                | OK      | black sagebrush           |
| Arsp  | <i>Artemisia spinescens</i>                          | OK      | bud sagebrush, budsage    |
| Artrw | <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> | OK      | Wyoming big sagebrush     |
| Artrt | <i>Artemisia tridentata</i> ssp. <i>tridentata</i>   | OK      | basin big sagebrush       |
| Artrv | <i>Artemisia tridentata</i> ssp. <i>vaseyana</i>     | OK      | mountain big sagebrush    |
| Artr1 | <i>Artemisia tripartita</i>                          | OK      | threetip sagebrush        |
| Atca  | <i>Atriplex canescens</i>                            | OK      | fourwing saltbush         |
| Atco  | <i>Atriplex confertifolia</i>                        | OK      | shadscale                 |
| Atga  | <i>Atriplex gardneri</i>                             | OK      | Gardner saltbush          |
|       | <i>Berberis repens</i>                               | = Mare  |                           |
| Befo  | <i>Betula fontinalis</i>                             | OK      | river birch               |
| Begl  | <i>Betula glandulosa</i>                             | OK      | bog birch                 |
|       | <i>Betula occidentalis</i>                           | = Befo  |                           |
| Bepa  | <i>Betula papyrifera</i>                             | OK      | paper birch               |
| Cefe  | <i>Ceanothus fendleri</i>                            | OK      | Fendler ceanothus         |
| Cema  | <i>Ceanothus martinii</i>                            | OK      | Martin ceanothus          |
| Ceve  | <i>Ceanothus velutinus</i>                           | OK      | snowbrush                 |
| Ceoc2 | <i>Celtis occidentalis</i>                           | OK      | western hackberry         |
|       | <i>Ceratoides lanata</i>                             | = Eula  |                           |
| Cele  | <i>Cercocarpus ledifolius</i>                        | OK      | curlleaf mtn.-mahogany    |
| Cemo  | <i>Cercocarpus montanus</i>                          | OK      | mountain-mahogany         |
| Chde  | <i>Chrysothamnus depressa</i>                        | OK      | dwarf rabbitbrush         |
| Chna  | <i>Chrysothamnus nauseosus</i>                       | OK      | rubber rabbitbrush        |
| Chpa3 | <i>Chrysothamnus parryi</i>                          | OK      | Parry rabbitbrush         |
| Chvi3 | <i>Chrysothamnus viscidiflorus</i>                   | OK      | Douglas rabbitbrush       |
| Clco  | <i>Clematis columbiana</i>                           | OK      | clematis                  |
| Cl11  | <i>Clematis ligusticifolia</i>                       | OK      | virgins-bower             |
| Clps  | <i>Clematis pseudoalpina</i>                         | OK      | purple virgins-bower      |
| Clte  | <i>Clematis tenuiloba</i>                            | OK      | matted virgins-bower      |
|       | <i>Cornus stolonifera</i>                            | = Swse  |                           |
| Coam  | <i>Corylus americana</i>                             | OK      | American hazelnut         |
| Cocol | <i>Corylus cornuta</i>                               | OK      | beaked hazel              |
| Covi  | <i>Coryphantha vivipara</i>                          | OK      | coryphantha               |

Crsu Crataegus succulenta  
 Diin Distegia involucrata  
 Droc Dryas octopetala  
 Ecfe Echinocereus fendleri  
 Ectr Echinocereus triglochidiatus  
 Ecvi Echinocereus viridiflorus  
 Elan Elaeagnus angustifolia  
 Epvi Ephedra viridis  
 Eulal Eurotia lanata  
 Feru2 Fendlera rupicola  
 Frpe Fraxinus pennsylvanica  
 Gahu Gaultheria humifusa  
 Gusa Gutierrezia sarothrae  
 Hodu Holodiscus dumosus  
       Hymenoxys richardsonii  
 Jaam Jamesia americana  
 Juco Juniperus communis  
 Jucoa Juniperus communis ssp. alpina  
 Juho Juniperus horizontalis  
 Jumo Juniperus monosperma  
 Juos Juniperus osteosperma  
 Jusc Juniperus scopulorum  
 Juvi Juniperus virginiana  
 Kapo Kalmia polifolia  
       Krascheninnikova lanata  
 Lodil Lonicera dioica  
       Lonicera involucrata  
 Lout Lonicera utahensis  
 Mafr Mahonia fremontii  
 Mare Mahonia repens  
       Negundo aceroides  
       Opuntia arborescens  
 Opfr Opuntia fragilis  
 Opim Opuntia imbricata  
 Oppo Opuntia polyacantha  
 Osvi Ostrya virginiana  
 Pavil Padus virginiana  
 Pavim Padus virginiana ssp. melanocarpa  
 Pamy Paxistima myrsinites  
 Pesi Pediocactus simpsonii  
 Pefl1 Pentaphylloides floribunda  
 Pera2 Peraphyllum ramosissimum  
 Peca3 Petrophytum caespitosum  
 Phju Phoradendron juniperinum  
 Phem Phyllodoce empetrifloris  
 Phma Physocarpus malvaceus  
 Phmo Physocarpus monogynus  
 Pien1 Picea engelmannii  
 Pigl Picea glauca  
 Pipu Picea pungens  
 Piri Picradenia richardsonii  
 Pial Pinus albicaulis  
 Piar Pinus aristata  
 Pico Pinus contorta  
 Picol Pinus contorta ssp. latifolia  
 Pied Pinus edulis  
 Pifl1 Pinus flexilis  
 Pipu Pinus ponderosa  
 Pipos Pinus ponderosa ssp. scopulorum  
 Pist Pinus strobiformis  
 Poac1 Populus X acuminata  
 Poan3 Populus angustifolia

OK fleshy hawthorn  
 OK bearberry honeysuckle  
 OK golden avens  
 OK Fendler echinocereus  
 OK claret-cup  
 OK green echinocereus  
 OK Russian-olive  
 OK green ephedra  
 OK winterfat  
 OK Fendler-bush  
 OK green ash  
 OK wintergreen  
 OK snakeweed  
 OK ocean-spray  
 = Piri  
 OK Jamesia  
 OK common juniper  
 OK common juniper  
 OK creeping juniper  
 OK one-seed juniper  
 OK Utah juniper  
 OK Rocky Mtn. juniper  
 OK western red-cedar  
 OK bog kalmia  
 = Eula  
 OK wild honeysuckle  
 = Diin  
 OK Utah honeysuckle  
 OK Fremont mahonia  
 OK Oregon-grape  
 = Acne  
 = Opim  
 OK brittle prickly-pear  
 OK cholla  
 OK plains prickly-pear  
 OK eastern hop-hornbeam  
 OK chokecherry  
 OK chokecherry  
 OK myrtle pachistima  
 OK snowball cactus  
 OK shrubby cinquefoil  
 OK squawbush  
 OK rock-spiraea  
 OK juniper mistletoe  
 OK mountain-heath  
 OK mallow ninebark  
 OK mountain ninebark  
 OK Engelmann spruce  
 OK white spruce  
 OK blue spruce  
 OK pingue  
 OK whitebark pine  
 OK bristlecone pine  
 OK lodgepole pine  
 OK lodgepole pine  
 OK pinyon  
 OK limber pine  
 OK ponderosa pine  
 OK ponderosa pine  
 OK southwestern white pine  
 OK lanceleaf cottonwood  
 OK narrowleaf cottonwood



|       |                                    |         |                        |
|-------|------------------------------------|---------|------------------------|
| Poba  | Populus balsamifera                | OK      | balsam poplar          |
|       | Populus deltoides                  | = Posa  |                        |
| Pofr2 | Populus fremontii                  | OK      | Fremont cottonwood     |
| Posa  | Populus sargentii                  | OK      | plains cottonwood      |
| Potr1 | Populus tremuloides                | OK      | aspen                  |
| Powi  | Populus wislizenii                 | OK      | Rio Grande cottonwood  |
|       | Potentilla fruticosa               | = Pefl  |                        |
| Pram  | Prunus americana                   | OK      | American plum          |
| Prbe  | Prunus besseyi                     | OK      | Bessey plum            |
|       | Prunus virginiana var. melanocarpa | = Pavim |                        |
| Psme  | Pseudotsuga menziesii              | OK      | Douglas-fir            |
| Putr  | Purshia tridentata                 | OK      | bitterbrush            |
| Quga  | Quercus gambelii                   | OK      | Gambel oak             |
| Quma  | Quercus macrocarpa                 | OK      | bur oak                |
| Quun  | Quercus undulata                   | OK      | wavyleaf oak           |
| Rh1a1 | Rhamnus lanceolata                 | OK      | lanceleaf buckthorn    |
| Rhart | Rhus aromatica ssp. trilobata      | OK      | skunkbrush             |
|       | Rhus radicans                      | = Tory  |                        |
|       | Rhus trilobata                     | = Rhart |                        |
| Riam  | Ribes americanum                   | OK      | American black currant |
| Riau  | Ribes aureum                       | OK      | golden currant         |
| Rice  | Ribes cereum                       | OK      | wax currant            |
| Ricol | Ribes coloradense                  | OK      | Colorado currant       |
| Riin1 | Ribes inebrians                    | OK      | squaw currant          |
| Riin2 | Ribes inerme                       | OK      | whitestem gooseberry   |
| Rila  | Ribes lacustre                     | OK      | prickly currant        |
| Rimo  | Ribes montigenum                   | OK      | gooseberry currant     |
| Riod  | Ribes odoratum                     | OK      | buffalo currant        |
| Rise  | Ribes setosum                      | OK      | spiny currant          |
| Riwo  | Ribes wolfii                       | OK      | Rothrock currant       |
| Rone1 | Robinia neomexicana                | OK      | New Mexico locust      |
| Roac  | Rosa acicularis                    | OK      | prickly rose           |
| Roar2 | Rosa arkansana                     | OK      | Arkansas rose          |
| Rowo  | Rosa woodsii                       | OK      | Woods rose             |
|       | Rubacer parviflorum                | = Rupa  |                        |
| Rude  | Rubus deliciosus                   | OK      | boulder raspberry      |
| Ruidm | Rubus idaeus ssp. melanolasius     | OK      | red raspberry          |
| Rupa  | Rubus parviflorus                  | OK      | thimbleberry           |
|       | Sabina osteosperma                 | = Juos  |                        |
| Saam  | Salix amygdaloides                 | OK      | peachleaf willow       |
|       | Salix bebbiana                     | = Sade  |                        |
| Sabol | Salix boothii                      | OK      | Booth willow           |
| Sabr1 | Salix brachycarpa                  | OK      | barrenground willow    |
| Saca6 | Salix candida                      | OK      | hoary willow           |
| Saca4 | Salix caudata                      | OK      | whiplash willow        |
| Sadel | Salix depressa                     | OK      | Bebb willow            |
| Sadr  | Salix drummondiana                 | OK      | Drummond willow        |
| Saex  | Salix exigua                       | OK      | coyote willow          |
| Sage  | Salix geyeriana                    | OK      | Geyer willow           |
| Sagl1 | Salix glauca                       | OK      | grayleaf willow        |
| Sain  | Salix interior                     | OK      | sandbar willow         |
| Sali  | Salix ligulifolia                  | OK      |                        |
| Salu  | Salix lutea                        | OK      | yellow willow          |
| Samol | Salix monticola                    | OK      | serviceberry willow    |
| Sapel | Salix petiolaris                   | OK      | meadow willow          |
| Saphp | Salix phylicifolia ssp. planifolia | OK      | planeleaf willow       |
|       | Salix planifolia                   | = Saphp |                        |
|       | Salix pseudolapponum               | = Sagl  |                        |
| Sari  | Salix rigida                       | OK      | diamond willow         |
| Sasc  | Salix scouleriana                  | OK      | Scouler willow         |
| Savi  | Salix villosa                      | OK      | hairy willow           |
| Sawo  | Salix wolfii                       | OK      | Wolfs willow           |

|       |                                                   |         |                         |
|-------|---------------------------------------------------|---------|-------------------------|
| Saca5 | <i>Sambucus canadensis</i>                        | OK      | elderberry              |
| Sarap | <i>Sambucus racemosa</i> ssp. <i>pubens</i>       | OK      | bunchberry elder        |
| Save2 | <i>Sarcobatus vermiculatus</i>                    | OK      | greasewood              |
|       | <i>Seriphidium vaseyanum</i>                      | = Artrv |                         |
| Shar  | <i>Shepherdia argentea</i>                        | OK      | silver buffaloberry     |
| Shca  | <i>Shepherdia canadensis</i>                      | OK      | russet buffaloberry     |
| Sosc  | <i>Sorbus scopulina</i>                           | OK      | Greenes mountain-ash    |
| Spbe  | <i>Spiraea betulifolia</i>                        | OK      | white spiraea           |
| Swse  | <i>Swida sericea</i>                              | OK      | red-osier dogwood       |
| Syal  | <i>Symphoricarpos albus</i>                       | OK      | common snowberry        |
| Syoc  | <i>Symphoricarpos occidentalis</i>                | OK      | western snowberry       |
| Syor1 | <i>Symphoricarpos oreophilus</i>                  | OK      | mountain snowberry      |
| Teca  | <i>Tetradymia canescens</i>                       | OK      | gray horsebrush         |
| Tesp  | <i>Tetradymia spinosa</i>                         | OK      | spiny horsebrush        |
| Tiam  | <i>Tilia americana</i>                            | OK      | basswood                |
| Tory  | <i>Toxicodendron rydbergii</i>                    | OK      | poison-ivy              |
| Ulam  | <i>Ulmus americana</i>                            | OK      | American elm            |
|       | <i>Vaccinium caespitosum</i>                      | = Vace  |                         |
| Vace  | <i>Vaccinium cespitosum</i>                       | OK      | dwarf blueberry         |
| Vagl  | <i>Vaccinium globulare</i>                        | OK      | globe huckleberry       |
| Vame  | <i>Vaccinium membranaceum</i>                     | OK      | big whortleberry        |
| Vamy  | <i>Vaccinium myrtillus</i>                        | OK      | Rocky Mtn. whortleberry |
| Vamyo | <i>Vaccinium myrtillus</i> ssp. <i>oreophilum</i> | OK      | Rocky Mtn. whortleberry |
|       | <i>Vaccinium oreophilus</i>                       | = Vamyo |                         |
| Vasc  | <i>Vaccinium scoparium</i>                        | OK      | grouse whortleberry     |
| Vivu  | <i>Vitis vulpina</i>                              | OK      | frost grape             |
|       | <i>Xanthocephalum sarothrae</i>                   | = Gusa  |                         |
| Yuba  | <i>Yucca baccata</i>                              | OK      | datil yucca             |
| Yugl  | <i>Yucca glauca</i>                               | OK      | yucca, soapweed         |

## II. GRASSES AND GRASSLIKE PLANTS

|       |                                   |         |                    |
|-------|-----------------------------------|---------|--------------------|
|       | <i>Agropyron albicans</i>         | = Eldaa |                    |
| Agcr  | <i>Agropyron cristatum</i>        | OK      | fairway wheatgrass |
|       | <i>Agropyron dasystachyum</i>     | = Elda  |                    |
| Agdel | <i>Agropyron desertorum</i>       | OK      | crested wheatgrass |
|       | <i>Agropyron griffithsii</i>      | = Eldaa |                    |
|       | <i>Agropyron scribneri</i>        | = Elsc  |                    |
|       | <i>Agropyron smithii</i>          | = Elsm  |                    |
|       | <i>Agropyron spicatum</i>         | = Rosp  |                    |
|       | <i>Agropyron trachycaulum</i>     | = Eltr  |                    |
|       | <i>Agrostis alba</i>              | = Aggi  |                    |
| Agbo  | <i>Agrostis borealis</i>          | OK      | northern bentgrass |
| Aggi  | <i>Agrostis gigantea</i>          | OK      | redtop             |
| Aghu  | <i>Agrostis humilis</i>           | OK      | alpine bentgrass   |
| Aghy  | <i>Agrostis hyemalis</i>          | OK      | rough bentgrass    |
| Agme  | <i>Agrostis mertensii</i>         | OK      |                    |
|       | <i>Agrostis scabra</i>            | = Aghy  |                    |
|       | <i>Agrostis thurberiana</i>       | = Poth  |                    |
| Agva  | <i>Agrostis variabilis</i>        | OK      | variant bentgrass  |
| Alae  | <i>Alopecurus aequalis</i>        | OK      | shortawn foxtail   |
| Alal  | <i>Alopecurus alpinus</i>         | OK      | alpine foxtail     |
| Ange  | <i>Andropogon gerardii</i>        | OK      | big bluestem       |
| Anha  | <i>Andropogon hallii</i>          | OK      | sand bluestem      |
|       | <i>Andropogon saccharoides</i>    | = Bosa  |                    |
|       | <i>Andropogon scoparius</i>       | = Scsc  |                    |
|       | <i>Anisantha tectorum</i>         | = Brte  |                    |
| Arfel | <i>Aristida fendleriana</i>       | OK      | Fendler threeawn   |
| Arlo1 | <i>Aristida longiseta</i>         | OK      | red threeawn       |
|       | <i>Avena hookeri</i>              | = Heho  |                    |
| Bltr  | <i>Blepharoneuron tricholepis</i> | OK      | pine dropseed      |
| Bosa  | <i>Bothriochloa saccharoides</i>  | OK      | silver bluestem    |

|        |                                  |        |                     |
|--------|----------------------------------|--------|---------------------|
| Bocu   | Bouteloua curtipendula           | OK     | sideoats grama      |
| Bogr   | Bouteloua gracilis               | OK     | blue grama          |
| Bohi   | Bouteloua hirsuta                | OK     | hairy grama         |
|        | Bromus anomalus                  | = Brpo |                     |
| Brca5  | Bromus canadensis                | OK     | fringed brome       |
| Brca1  | Bromus carinatus                 | OK     | mountain brome      |
|        | Bromus ciliatus                  | = Brca |                     |
| Brin1  | Bromus inermis                   | OK     | smooth brome        |
|        | Bromus inermis ssp. pumpellianus | = Brpu |                     |
| Brja   | Bromus japonicus                 | OK     | Japanese cheat      |
| Brla1  | Bromus lanatipes                 | OK     |                     |
|        | Bromus marginatus                | = Brca |                     |
| Brpol  | Bromus porteri                   | OK     | nodding brome       |
| Brpul  | Bromus pumpellianus              | OK     | Pumpelly brome      |
| Brtel  | Bromus tectorum                  | OK     | cheatgrass          |
| Buda   | Buchloe dactyloides              | OK     | buffalo grass       |
| Caca   | Calamagrostis canadensis         | OK     | bluejoint reedgrass |
|        | Calamagrostis inexpansa          | = Cast |                     |
| Camo   | Calamagrostis montanensis        | OK     | plains reedgrass    |
|        | Calamagrostis neglecta           | = Cast |                     |
| Capul1 | Calamagrostis purpurascens       | OK     | purple pinegrass    |
| Carul  | Calamagrostis rubescens          | OK     | pinegrass           |
| Cast   | Calamagrostis stricta            | OK     | northern reedgrass  |
| Calo   | Calamovilfa longifolia           | OK     | prairie sandreed    |
| Caal1  | Carex albonigra                  | OK     | blackhead sedge     |
| Caaq   | Carex aquatilis                  | OK     | water sedge         |
| Caar3  | Carex arapahoensis               | OK     | Arapaho sedge       |
| Caar4  | Carex arctogena                  | OK     | capitate sedge      |
| Cabel  | Carex bebbii                     | OK     | Bebb sedge          |
| Cabl   | Carex blanda                     | OK     |                     |
| Caca2  | Carex canescens                  | OK     | pale sedge          |
|        | Carex capitata ssp. arctogena    | = Caar |                     |
| Cach1  | Carex chalciolepis               | OK     |                     |
| Caco   | Carex concinna                   | OK     | low northern sedge  |
|        | Carex crandallii                 | = Capy |                     |
| Cadi   | Carex disperma                   | OK     | softleaf sedge      |
| Caeb   | Carex ebenea                     | OK     | ebony sedge         |
| Caell  | Carex eleocharis                 | OK     | needleleaf sedge    |
| Cael   | Carex elynoides                  | OK     | elynoides sedge     |
| Caen   | Carex engelmannii                | OK     | Engelmann sedge     |
| Cafe   | Carex festivella                 | OK     | ovalhead sedge      |
| Cafi   | Carex filifolia                  | OK     | threadleaf sedge    |
| Cafo   | Carex foenea                     | OK     | silvertop sedge     |
| Cage   | Carex geophila                   | OK     | dryland sedge       |
| Cagel  | Carex geyeri                     | OK     | elk sedge           |
| Caha   | Carex haydeniana                 | OK     | cloud sedge         |
| Cahel  | Carex heliophila                 | OK     | sun sedge           |
| Cahol  | Carex hoodii                     | OK     | Hood sedge          |
|        | Carex incurviformis              | = Cama |                     |
| Calal  | Carex lacustris                  | OK     | lake sedge          |
| Cala   | Carex lanuginosa                 | OK     | woolly sedge        |
| Cama   | Carex maritima                   | OK     |                     |
| Cami4  | Carex microptera                 | OK     | smallwing sedge     |
| Canah  | Carex nardina ssp. hepburnii     | OK     | spikenard sedge     |
| Cane   | Carex nebrascensis               | OK     | Nebraska sedge      |
| Cani   | Carex nigricans                  | OK     | black alpine sedge  |
| Cano   | Carex nova                       | OK     | new sedge           |
| Caob   | Carex obtusata                   | OK     | blunt sedge         |
| Caocl  | Carex occidentalis               | OK     | western sedge       |
| Capal  | Carex pachystachya               | OK     | Chamisso sedge      |
| Cape4  | Carex peckii                     | OK     | Peck sedge          |
| Capel  | Carex perglabosa                 | OK     | Mt. Baldy sedge     |

|       |                                           |         |                             |
|-------|-------------------------------------------|---------|-----------------------------|
| Caph1 | Carex phaeocephala                        | OK      | dunhead sedge               |
| Capi  | Carex pityophila                          | OK      |                             |
| Capr2 | Carex praeceptorum                        | OK      | teachers' sedge             |
| Capr  | Carex praeagrabilis                       | OK      | silver sedge                |
| Capr1 | Carex praticola                           | OK      | meadow sedge                |
| Capy  | Carex pyrenaica                           | OK      | Pyrenees sedge              |
| Cara  | Carex raynoldsii                          | OK      | Raynolds sedge              |
| Caro3 | Carex rossii                              | OK      | Ross sedge                  |
|       | Carex rostrata                            | = Caut  |                             |
| Caru  | Carex rupestris                           | OK      | curly sedge                 |
| Carud | Carex rupestris ssp. drummondiana         | OK      | Drummond sedge              |
| Casa2 | Carex sartwellii                          | OK      | Sartwell sedge              |
| Casc3 | Carex scirpoidea                          | OK      | Canadian single-spike sedge |
| Casc4 | Carex scoparia                            | OK      | pointed broom sedge         |
| Casc2 | Carex scopulorum                          | OK      | cliff sedge                 |
| Casp  | Carex sprengelii                          | OK      | Sprengel sedge              |
| Caut  | Carex utriculata                          | OK      | beaked sedge                |
| Cavi  | Carex viridula                            | OK      | green sedge                 |
| Caxe  | Carex xerantica                           | OK      | dryland sedge               |
| Caaq1 | Catabrosa aquatica                        | OK      | brook-grass                 |
|       | Ceratochloa marginata                     | = Brca  |                             |
| Cysc  | Cyperus schweinitzii                      | OK      | Schweinitz flatsedge        |
| Dagl  | Dactylis glomerata                        | OK      | orchard grass               |
| Dain  | Danthonia intermedia                      | OK      | timber oatgrass             |
| Dapal | Danthonia parryi                          | OK      | Parry oatgrass              |
|       | Deschampsia caespitosa                    | = Dece  |                             |
| Dece  | Deschampsia cespitosa                     | OK      | tufted hairgrass            |
| Diols | Dichanthelium oligosanthos ssp. scribneri | OK      | Scribner panicum            |
| Diwil | Dichanthelium wilcoxianum                 | OK      | Wilcox panicum              |
| Disps | Distichlis spicata ssp. stricta           | OK      | saltgrass                   |
| Elac  | Eleocharis acicularis                     | OK      | needle spikesedge           |
|       | Eleocharis macrostachya                   | = Elpa  |                             |
| Elpal | Eleocharis palustris                      | OK      | common spikesedge           |
|       | Eleocharis pauciflora                     | = Elqu  |                             |
| Elqu  | Eleocharis quinqueflora                   | OK      | few-flower spikesedge       |
|       | Elymus ambiguus                           | = Leam  |                             |
| Elbal | Elymus bakeri                             | OK      | Baker wheatgrass            |
| Elca  | Elymus canadensis                         | OK      | Canada wildrye,             |
|       | Elymus cinereus                           | = Leci  |                             |
| Elcl  | Elymus elymoides                          | OK      | bottlebrush squirreltail    |
| Elgl  | Elymus glaucus                            | OK      | blue wildrye                |
| Ello  | Elymus longifolius                        | OK      | longleaf squirreltail       |
| Elsc  | Elymus scribneri                          | OK      | Scribner wheatgrass         |
| Eltrl | Elymus trachycaulus                       | OK      | slender wheatgrass          |
| Elvil | Elymus villosus                           | OK      | hairy wildrye               |
|       | Elytrigia albicans                        | = Eldaa |                             |
| Elda  | Elytrigia dasystachya                     | OK      | thickspike wheatgrass       |
| Eldaa | Elytrigia dasystachya ssp. albicans       | OK      | Montana wheatgrass          |
| Elgr  | Elytrigia griffithsii                     | OK      | Griffiths wheatgrass        |
| Elsm  | Elytrigia smithii                         | OK      | western wheatgrass          |
| Ertrl | Eragrostis trichodes                      | OK      | sand lovegrass              |
| Eran3 | Eriophorum angustifolium                  | OK      | cottonsedge                 |
| Fearl | Festuca arizonica                         | OK      | Arizona fescue              |
| Febr  | Festuca brachyphylla                      | OK      | alpine fescue               |
| Febrc | Festuca brachyphylla ssp. coloradensis    | OK      | alpine fescue               |
| Feid  | Festuca idahoensis                        | OK      | Idaho fescue                |
| Femi  | Festuca minutiflora                       | OK      |                             |
| Feoc  | Festuca octoflora                         | OK      | sixweeks fescue             |
|       | Festuca ovina                             | = Febrc |                             |
| Ferul | Festuca rubra                             | OK      | red fescue                  |
| Fesa  | Festuca saximontana                       | OK      | Rocky Mtn. fescue           |
| Fesc  | Festuca scabrella                         | OK      | rough fescue                |

|       |                                               |         |                      |
|-------|-----------------------------------------------|---------|----------------------|
| Feth  | <i>Festuca thurberi</i>                       | OK      | Thurber fescue       |
| Glgr  | <i>Glyceria grandis</i>                       | OK      | American mannagrass  |
| Glst  | <i>Glyceria striata</i>                       | OK      | fowl mannagrass      |
| Hehol | <i>Helictotrichon hookeri</i>                 | OK      | spike oatgrass       |
| Hemo  | <i>Helictotrichon mortonianum</i>             | OK      | alpine oat           |
|       | <i>Hesperochloa kingii</i>                    | = Lekii |                      |
| Hihi  | <i>Hierochloa hirta</i>                       | OK      | sweetgrass           |
|       | <i>Hierochloa odorata</i>                     | = Hihi  |                      |
| Hija  | <i>Hilaria jamesii</i>                        | OK      | galleta              |
| Hopu  | <i>Hordeum pusillum</i>                       | OK      | little barley        |
| Juara | <i>Juncus arcticus</i> spp. ater              | OK      | Baltic rush          |
|       | <i>Juncus balticus</i>                        | = Juara |                      |
| Juca  | <i>Juncus castaneus</i>                       | OK      | chestnut rush        |
| Judr  | <i>Juncus drummondii</i>                      | OK      | Drummond rush        |
| Julo  | <i>Juncus longistylis</i>                     | OK      | longstyle rush       |
| Jume  | <i>Juncus mertensianus</i>                    | OK      | Mertens rush         |
| Juno  | <i>Juncus nodosus</i>                         | OK      | jointed rush         |
| Jusa  | <i>Juncus saximontanus</i>                    | OK      | Rocky Mtn. rush      |
| Jutrl | <i>Juncus triglumis</i>                       | OK      | three-flower rush    |
|       | <i>Kobresia bellardii</i>                     | = Komy  |                      |
| Komy  | <i>Kobresia myosuroides</i>                   | OK      | kobresia             |
| Kosi  | <i>Kobresia sibirica</i>                      | OK      | Siberian kobresia    |
|       | <i>Koeleria cristata</i>                      | = Koma  |                      |
| Koma  | <i>Koeleria macrantha</i>                     | OK      | prairie junegrass    |
| Leki  | <i>Leucopoa kingii</i>                        | OK      | spike-fescue         |
| Leam  | <i>Leymus ambiguus</i>                        | OK      | Colorado wildrye     |
| Leci  | <i>Leymus cinereus</i>                        | OK      | giant wildrye        |
| Lesal | <i>Leymus salinae</i>                         | OK      | Salina wildrye       |
| Lupal | <i>Luzula parviflora</i>                      | OK      | millet woodrush      |
| Luspl | <i>Luzula spicata</i>                         | OK      | spike woodrush       |
| Mebu  | <i>Melica bulbosa</i>                         | OK      | onion-grass          |
| Mesp3 | <i>Melica spectabilis</i>                     | OK      | showy oniongrass     |
| Mucu  | <i>Muhlenbergia cuspidata</i>                 | OK      | stonyhills muhly     |
| Mufil | <i>Muhlenbergia filiculmis</i>                | OK      | slimstem muhly       |
| Mufi2 | <i>Muhlenbergia filiformis</i>                | OK      | pullup muhly         |
| Mumol | <i>Muhlenbergia montana</i>                   | OK      | mountain muhly       |
| Mupu  | <i>Muhlenbergia pungens</i>                   | OK      | sandhills muhly      |
| Mural | <i>Muhlenbergia racemosa</i>                  | OK      | green muhly          |
| Muto  | <i>Muhlenbergia torreyi</i>                   | OK      | ring muhly           |
| Muwr  | <i>Muhlenbergia wrightii</i>                  | OK      | spike muhly          |
| Oras  | <i>Oryzopsis asperifolia</i>                  | OK      | roughleaf ricegrass  |
| Orhy  | <i>Oryzopsis hymenoides</i>                   | OK      | Indian ricegrass     |
| Ormi  | <i>Oryzopsis micrantha</i>                    | OK      | littleseed ricegrass |
| Paca  | <i>Panicum capillare</i>                      | OK      | witchgrass           |
| Paob  | <i>Panicum obtusum</i>                        | OK      | vine-mesquite        |
|       | <i>Panicum oligosanthos</i>                   | = Diols |                      |
| Pasc  | <i>Panicum scribnerianum</i>                  | OK      | Scribner panicum     |
|       | <i>Panicum scribnerianum</i>                  | = Diols |                      |
| Pavi  | <i>Panicum virgatum</i>                       | OK      | switchgrass          |
|       | <i>Panicum wilcoxianum</i>                    | = Diwi  |                      |
|       | <i>Pascopyrum smithii</i>                     | = Elsm  |                      |
| Phar  | <i>Phalaris arundinacea</i>                   | OK      | reed canarygrass     |
|       | <i>Phleum alpinum</i>                         | = Phco  |                      |
| Phco  | <i>Phleum commutatum</i>                      | OK      | alpine timothy       |
| Phpr  | <i>Phleum pratense</i>                        | OK      | common timothy       |
| Phco  | <i>Phragmites communis</i>                    | OK      | common reedgrass     |
| Poabp | <i>Poa abbreviata</i> ssp. <i>pattersonii</i> | OK      | Patterson bluegrass  |
| Poag  | <i>Poa aggasizensis</i>                       | OK      |                      |
| Poall | <i>Poa alpina</i>                             | OK      | alpine bluegrass     |
| Poam  | <i>Poa ampla</i>                              | OK      | big bluegrass        |
| Poanl | <i>Poa annua</i>                              | OK      | annual bluegrass     |
| Poar2 | <i>Poa arctica</i>                            | OK      | arctic bluegrass     |



|       |                                               |    |                         |
|-------|-----------------------------------------------|----|-------------------------|
| Poar1 | <i>Poa arida</i>                              | OK | plains bluegrass        |
| Poca  | <i>Poa canbyi</i>                             | OK | Canby bluegrass         |
| Pocol | <i>Poa compressa</i>                          | OK | Canada bluegrass        |
| Pocu  | <i>Poa cusickii</i>                           | OK | Cusick bluegrass        |
| Poep  | <i>Poa epilis</i>                             | OK | skyline bluegrass       |
| Pofe  | <i>Poa fendleriana</i>                        | OK | muttongrass             |
| Pogl2 | <i>Poa glauca</i>                             | OK | Greenland bluegrass     |
|       | <i>Poa interior</i>                           | =  | Ponei                   |
| Poju  | <i>Poa juncifolia</i>                         | OK | alkali bluegrass        |
| Pole  | <i>Poa leptocoma</i>                          | OK | bog bluegrass           |
| Ponei | <i>Poa nemoralis</i> ssp. <i>interior</i>     | OK | inland bluegrass        |
| Pone2 | <i>Poa nervosa</i>                            | OK | Wheeler bluegrass       |
| Pone  | <i>Poa nevadensis</i>                         | OK | Nevada bluegrass        |
| Popa  | <i>Poa palustris</i>                          | OK | fowl bluegrass          |
|       | <i>Poa pattersonii</i>                        | =  | Poabp                   |
| Popr  | <i>Poa pratensis</i>                          | OK | Kentucky bluegrass      |
| Pore  | <i>Poa reflexa</i>                            | OK | nodding bluegrass       |
|       | <i>Poa rupicola</i>                           | =  | Pogl                    |
|       | <i>Poa sandbergii</i>                         | =  | Posa                    |
| Pose  | <i>Poa secunda</i>                            | OK | Sandberg bluegrass      |
| Potr4 | <i>Poa tracyi</i>                             | OK |                         |
| Poth  | <i>Podagrostis thurberiana</i>                | OK | Thurber bentgrass       |
| Puai  | <i>Puccinellia airoides</i>                   | OK | Nuttall alkaligrass     |
|       | <i>Puccinellia nuttalliana</i>                | =  | Puai                    |
| Ref1  | <i>Redfieldia flexuosa</i>                    | OK | blowout grass           |
| Rosp  | <i>Roegneria spicata</i>                      | OK | bluebunch wheatgrass    |
| Rosp1 | <i>Roegneria spicata</i> ssp. <i>inermis</i>  | OK | beardless bluebunch     |
| Scpa  | <i>Schedonnardus paniculatus</i>              | OK | tumble grass            |
| Scpu  | <i>Schizachne purpurascens</i>                | OK | false-melic             |
| Scsc  | <i>Schizachyrium scoparium</i>                | OK | little bluestem         |
| Scac  | <i>Scirpus acutus</i>                         | OK | tule bulrush            |
| Scam  | <i>Scirpus americanus</i>                     | OK | American bulrush        |
| Scmi  | <i>Scirpus microcarpus</i>                    | OK | panicled bulrush        |
| Scpal | <i>Scirpus paludosus</i>                      | OK | alkali bulrush          |
|       | <i>Sitanion hystrix</i>                       | =  | Elel                    |
|       | <i>Sitanion longifolium</i>                   | =  | Ello                    |
|       | <i>Sorghastrum nutans</i>                     | =  | Soav                    |
| Soav  | <i>Sorghastrum avenaceum</i>                  | OK | Indian grass            |
| Sppel | <i>Spartina pectinata</i>                     | OK | prairie cordgrass       |
| Spob  | <i>Sphenopholis obtusata</i>                  | OK | prairie wedgegrass      |
| Spai  | <i>Sporobolus airoides</i>                    | OK | alkali sacaton          |
| Spas  | <i>Sporobolus asper</i>                       | OK | tall dropseed           |
| Spcr  | <i>Sporobolus cryptandrus</i>                 | OK | sand dropseed           |
| Sphe  | <i>Sporobolus heterolepis</i>                 | OK | prairie dropseed        |
| Spte  | <i>Sporobolus texanus</i>                     | OK | Texas dropseed          |
|       | <i>Stipa columbiana</i>                       | =  | Stne                    |
| Stcol | <i>Stipa comata</i>                           | OK | needle-and-thread       |
| Stle  | <i>Stipa lettermanii</i>                      | OK | Letterman needlegrass   |
| Stnel | <i>Stipa nelsonii</i>                         | OK | subalpine needlegrass   |
| Stne  | <i>Stipa neomexicana</i>                      | OK | New Mexico feathergrass |
|       | <i>Stipa occidentalis</i>                     | =  | Stle                    |
| Stpil | <i>Stipa pinetorum</i>                        | OK | pinewoods needlegrass   |
| Stro  | <i>Stipa robusta</i>                          | OK | sleepygrass             |
| Stsc  | <i>Stipa scribneri</i>                        | OK | Scribner needlegrass    |
| Stspl | <i>Stipa spartea</i>                          | OK | porcupine grass         |
| Stvi  | <i>Stipa viridula</i>                         | OK | green needlegrass       |
| Trsp  | <i>Trisetum spicatum</i>                      | OK | spike trisetum          |
| Trspm | <i>Trisetum spicatum</i> ssp. <i>montanum</i> | OK | spike trisetum          |
| Trwo  | <i>Trisetum wolffii</i>                       | OK | Wolfs trisetum          |

### III. FORBS

|       |                                                        |         |                         |
|-------|--------------------------------------------------------|---------|-------------------------|
| Acla  | <i>Achillea lanulosa</i>                               | OK      | yarrow                  |
|       | <i>Achillea millefolium</i>                            | = Acla  |                         |
| Acrot | <i>Acomastylis rossii</i> ssp. <i>turbinatum</i>       | OK      | golden avens            |
| Acco2 | <i>Aconitum columbianum</i>                            | OK      | monks-hood              |
| Acru  | <i>Actaea rubra</i>                                    | OK      | red baneberry           |
|       | <i>Adenolinum lewisii</i>                              | = Lile  |                         |
| Admo  | <i>Adoxa moschatellina</i>                             | OK      | muskroot                |
| Agur  | <i>Agastache urticifolia</i>                           | OK      | horse-mint              |
| Agau  | <i>Agoseris aurantiaca</i>                             | OK      | orange mtn.-dandelion   |
| Aggl  | <i>Agoseris glauca</i>                                 | OK      | pale mtn.-dandelion     |
| Alce  | <i>Allium cernuum</i>                                  | OK      | nodding onion           |
| Algel | <i>Allium geveryi</i>                                  | OK      | Geyer onion             |
| Altel | <i>Allium textile</i>                                  | OK      | textile onion           |
| Amps  | <i>Ambrosia psilostachya</i>                           | OK      | western ragweed         |
| Anma  | <i>Anaphalis margaritacea</i>                          | OK      | pearly-everlasting      |
| Anse  | <i>Androsace septentrionalis</i>                       | OK      | rock-jasmine            |
| Annal | <i>Anemonastrum narcissiflorum</i>                     | OK      | narcissus anemone       |
| Anmu  | <i>Anemone multifida</i>                               | OK      | Hudsonian anemone       |
|       | <i>Anemone patens</i>                                  | = Pupam |                         |
| Anam  | <i>Angelica ampla</i>                                  | OK      | angelica                |
| Angr  | <i>Angelica grayi</i>                                  | OK      | Grays angelica          |
|       | <i>Antennaria alpina</i>                               | = Anme  |                         |
| Anco2 | <i>Antennaria corymbosa</i>                            | OK      | plains pussytoes        |
| Anme  | <i>Antennaria media</i>                                | OK      | alpine pussytoes        |
| Anmi  | <i>Antennaria microphylla</i>                          | OK      | littleleaf pussytoes    |
| Anpal | <i>Antennaria parvifolia</i>                           | OK      | Nuttall pussytoes       |
| Anpl  | <i>Antennaria plataginifolia</i>                       | OK      | plantain-leaf pussytoes |
| Anpua | <i>Antennaria pulcherrima</i> ssp. <i>anaphaloides</i> | OK      | showy pussytoes         |
| Anro  | <i>Antennaria rosea</i>                                | OK      | rose pussytoes          |
| Anum  | <i>Antennaria umbrinella</i>                           | OK      | umber pussytoes         |
|       | <i>Anticlea elegans</i>                                | = Ziel  |                         |
| Apan  | <i>Apocynum androsaemifolium</i>                       | OK      | spreading dog-bane      |
| Aqbr  | <i>Aquilegia brevistyla</i>                            | OK      | western columbine       |
|       | <i>Aquilegia caerulea</i>                              | = Aqco  |                         |
| Aqco  | <i>Aquilegia coerulea</i>                              | OK      | Colorado columbine      |
|       | <i>Arabis demissa</i>                                  | = Arox  |                         |
| Ardi2 | <i>Arabis divaricarpa</i>                              | OK      | spreading-pod rockcress |
| Ardr1 | <i>Arabis drummondii</i>                               | OK      | Drummond rockcress      |
|       | <i>Arabis glabra</i>                                   | = Tugl  |                         |
|       | <i>Arabis holboellii</i>                               | = Arre  |                         |
| Arox  | <i>Arabis oxylobula</i>                                | OK      | limestone rockcress     |
| Arre  | <i>Arabis retrofracta</i>                              | OK      | Holboel rockcress       |
| Arse  | <i>Arabis selbyi</i>                                   | OK      | Selby rockcress         |
| Arnul | <i>Aralia nudicaulis</i>                               | OK      | wild sarsaparilla       |
| Armi1 | <i>Arctium minus</i>                                   | OK      | smaller burdock         |
|       | <i>Arenaria congesta</i>                               | = Erco  |                         |
|       | <i>Arenaria fendleri</i>                               | = Erfe  |                         |
|       | <i>Arenaria obtusiloba</i>                             | = Libi  |                         |
| Arani | <i>Argentina anserina</i>                              | OK      | silverweed              |
| Archf | <i>Arnica chamissonis</i> ssp. <i>foliosa</i>          | OK      | leafy arnica            |
| Arco2 | <i>Arnica cordifolia</i>                               | OK      | heartleaf arnica        |
| Arla  | <i>Arnica latifolia</i>                                | OK      | broadleaf arnica        |
| Arlo2 | <i>Arnica longifolia</i>                               | OK      | longleaf arnica         |
| Arry  | <i>Arnica rydbergii</i>                                | OK      | Rydberg arnica          |
| Arar4 | <i>Artemisia arctica</i>                               | OK      | arctic sage             |
|       | <i>Artemisia borealis</i>                              | = Argr  |                         |
| Ardr3 | <i>Artemisia dranunculus</i>                           | OK      | false-tarragon          |
| Arfr2 | <i>Artemisia franserioides</i>                         | OK      | ragweed sage            |
| Argr  | <i>Artemisia groenlandicus</i>                         | OK      | alpine sage             |
| Arlu  | <i>Artemisia ludoviciana</i>                           | OK      | Louisiana sage          |

|        |                                                  |        |                           |
|--------|--------------------------------------------------|--------|---------------------------|
| Arsc   | <i>Artemisia scopulorum</i>                      | OK     | alpine sage               |
| Asarl  | <i>Asclepias arenaria</i>                        | OK     | sand milkweed             |
| Asad1  | <i>Aster adscendens</i>                          | OK     | longleaf aster            |
|        | <i>Aster arenosus</i>                            | = Leer |                           |
|        | <i>Aster canescens</i>                           | = Maca |                           |
|        | <i>Aster commutatus</i>                          | = Vifa |                           |
| Asen   | <i>Aster engelmannii</i>                         | OK     | Engelmann aster           |
|        | <i>Aster ericoides</i>                           | = Leer |                           |
|        | <i>Aster falcatus</i>                            | = Vifa |                           |
| Asfo   | <i>Aster foliaceus</i>                           | OK     | leafybract aster          |
| Ashel  | <i>Aster hesperius</i>                           | OK     | Siskiyou aster            |
| Ashe   | <i>Aster heterolepis</i>                         | OK     | Siskiyou aster            |
| Asla   | <i>Aster laevis</i>                              | OK     | smooth aster              |
| Asob   | <i>Aster oblongifolius</i>                       | OK     | prairie aster             |
| Asoc   | <i>Aster occidentalis</i>                        | OK     | western aster             |
| Aspe   | <i>Aster perelegans</i>                          | OK     | Nuttallaster              |
| Aspt   | <i>Aster ptarmicoides</i>                        | OK     | sneezewort aster          |
| Asag   | <i>Astragalus agrestis</i>                       | OK     | purple milkvetch          |
| Asal2  | <i>Astragalus alpinus</i>                        | OK     | alpine milkvetch          |
| Asha   | <i>Astragalus hallii</i>                         | OK     | Halls milkvetch           |
| Asmi   | <i>Astragalus miser</i>                          | OK     | decumbent milkvetch       |
| Asmol  | <i>Astragalus molybdenus</i>                     | OK     | Leadville milkvetch       |
| Asrom  | <i>Astragalus robbinsii</i> var. <i>minor</i>    | OK     | Robbins milkvetch         |
| Atar   | <i>Atriplex argentea</i>                         | OK     | silverscale               |
|        | <i>Bahia oppositifolia</i>                       | = Piop |                           |
| Bain   | <i>Balsamorhiza incana</i>                       | OK     | hoary balsamroot          |
| Basal2 | <i>Balsamorhiza sagittata</i>                    | OK     | arrowleaf balsamroot      |
| Beal   | <i>Besseyia alpina</i>                           | OK     | alpine kittentails        |
| Bibil  | <i>Bistorta bistortoides</i>                     | OK     | alpine bistort            |
| Bivi   | <i>Bistorta vivipara</i>                         | OK     | viviparous bistort        |
| Bolu   | <i>Botrychium lunaria</i>                        | OK     | grapefern                 |
| Brgr   | <i>Brickellia grandiflora</i>                    | OK     | largeflower thorough-wort |
| Cahe4  | <i>Callitriche hermaphroditica</i>               | OK     | autumn water-starwort     |
| Cagu   | <i>Calochortus gunnisonii</i>                    | OK     | Gunnison sego-lily        |
| Canu   | <i>Calochortus nuttallii</i>                     | OK     | sego-lily mariposa        |
| Cale1  | <i>Caltha leptosepala</i>                        | OK     | marsh-marigold            |
| Case3  | <i>Calylophus serrulatus</i>                     | OK     | shrubby evening-primrose  |
| Capa   | <i>Campanula parryi</i>                          | OK     | Parry bellflower          |
| Carol  | <i>Campanula rotundifolia</i>                    | OK     | harebell                  |
| Caun   | <i>Campanula uniflora</i>                        | OK     | oneflower bluebells       |
| Cabu   | <i>Capsella bursa-pastoris</i>                   | OK     | shepherds-purse           |
| Caco2  | <i>Cardamine cordifolia</i>                      | OK     | brook-cress               |
| Caan   | <i>Castilleja angustifolia</i>                   | OK     | narrowleaf paintbrush     |
| Cal11  | <i>Castilleja linearifolia</i>                   | OK     | Wyoming paintbrush        |
| Cami   | <i>Castilleja miniata</i>                        | OK     | scarlet paintbrush        |
| Caoc   | <i>Castilleja occidentalis</i>                   | OK     | western paintbrush        |
| Carh   | <i>Castilleja rhexifolia</i>                     | OK     | splitleaf paintbrush      |
| Casu   | <i>Castilleja sulphurea</i>                      | OK     | sulfur paintbrush         |
| Cear   | <i>Cerastium arvense</i>                         | OK     | mouse-ear chickweed       |
| Cebe2  | <i>Cerastium beeringianum</i>                    | OK     | Bering cerastium          |
| Chall  | <i>Chaenactis alpina</i>                         | OK     | alpine chaenactis         |
| Chdo   | <i>Chaenactis douglasii</i>                      | OK     | Douglas chaenactis        |
| Chan   | <i>Chamerion angustifolium</i>                   | OK     | fire-weed                 |
| Chla   | <i>Chamerion latifolium</i>                      | OK     | red willow-weed           |
| Chca1  | <i>Cheilanthes cancellata</i>                    | OK     | zigzag cloakfern          |
| Chbe   | <i>Chenopodium berlandieri</i>                   | OK     | pitted goosefoot          |
| Chdel  | <i>Chenopodium desiccatum</i>                    | OK     | Fremont goosefoot         |
| Chfr   | <i>Chenopodium fremontii</i>                     | OK     | Fremont goosefoot         |
| Chum   | <i>Chimaphila umbellata</i>                      | OK     | pipsissewa                |
| Chja   | <i>Chionophila jamesii</i>                       | OK     | snow-lover                |
|        | <i>Chlorocrepis fendleri</i>                     | = Hife |                           |
|        | <i>Chlorocrepis tristis</i> ssp. <i>gracilis</i> | = Higr |                           |

|       |                                         |                               |
|-------|-----------------------------------------|-------------------------------|
|       | <i>Chondrophylla prostrata</i>          | = Gepr                        |
|       | <i>Chrysopsis villosa</i>               | = Hevi                        |
| Cido  | <i>Cicuta douglasii</i>                 | OK water-hemlock              |
|       | <i>Cicuta maculata</i>                  | = Cido                        |
| Ciau  | <i>Ciliaria austromontana</i>           | OK yellowdot saxifrage        |
| Ciarl | <i>Cirsium arvense</i>                  | OK Canada thistle             |
| Cico  | <i>Cirsium coloradense</i>              | OK Colorado thistle           |
| Cipa2 | <i>Cirsium parryi</i>                   | OK Parry thistle              |
| Cisc  | <i>Cirsium scopulorum</i>               | OK alpine thistle             |
| Ciun  | <i>Cirsium undulatum</i>                | OK wavyleaf thistle           |
| Clme  | <i>Claytonia megarhiza</i>              | OK alpine springbeauty        |
| Clrhl | <i>Clementsia rhodantha</i>             | OK rose-crown                 |
| Covil | <i>Coeloglossum viride</i>              | OK satyr bog-orchid           |
| Copa  | <i>Collinsia parviflora</i>             | OK blue-eyed-Mary             |
| Coli  | <i>Collomia linearis</i>                | OK slenderleaf gilia          |
| Coum  | <i>Comandra umbellata</i>               | OK toad-flax                  |
| Cosc  | <i>Conioselinum scopulorum</i>          | OK Rocky Mtn. hemlock-parsley |
| Cotr  | <i>Corallorhiza trifida</i>             | OK early coral-root           |
| Crac  | <i>Crepis acuminata</i>                 | OK beaked hawksbeard          |
| Crru  | <i>Crepis runcinata</i>                 | OK dandelion hawksbeard       |
| Crvi  | <i>Cryptantha virgata</i>               | OK spring catseye             |
| Crac1 | <i>Cryptogramma acrostichoides</i>      | OK American rockbrake         |
|       | <i>Cryptogramma crispa</i>              | = Crac                        |
| Cyfr  | <i>Cystopteris fragilis</i>             | OK brittle bladder-fern       |
| Dapul | <i>Dalea purpurea</i>                   | OK purple prairie-clover      |
| Davi  | <i>Dalea villosa</i>                    | OK silky prairie-clover       |
| Debal | <i>Delphinium barbeyi</i>               | OK Barbey larkspur            |
| Degel | <i>Delphinium geyeri</i>                | OK Geyer larkspur             |
|       | <i>Delphinium nelsonii</i>              | = Denu                        |
| Denu  | <i>Delphinium nuttallianum</i>          | OK Nuttall larkspur           |
| Depi  | <i>Descurainia pinnata</i>              | OK pinnate tansy-mustard      |
| Deri  | <i>Descurainia richardsonii</i>         | OK Richardson tansy-mustard   |
| Disy  | <i>Dipsacus sylvestris</i>              | OK teasel                     |
| Ditr  | <i>Disporum trachycarpum</i>            | OK fairy-bells                |
| Dopu  | <i>Dodecatheon pulchellum</i>           | OK shooting-star              |
| Dral  | <i>Draba albertina</i>                  | OK                            |
| Drau  | <i>Draba aurea</i>                      | OK golden draba,              |
| Drca  | <i>Draba cana</i>                       | OK lancolate draba            |
| Drcl  | <i>Draba crassifolia</i>                | OK hairy whitlow-grass        |
| Drfl  | <i>Draba fladzinensis</i>               | OK arctic draba               |
| Drin  | <i>Draba incerta</i>                    | OK Yellowstone draba          |
|       | <i>Draba lanceolata</i>                 | = Drca                        |
| Drlo  | <i>Draba lonchocarpa</i>                | OK lancefruit draba           |
| Drne  | <i>Draba nemorosa</i>                   | OK woods draba                |
|       | <i>Draba nivalis</i> var. <i>exigua</i> | = Drlo                        |
| Drpo  | <i>Draba porsildii</i>                  | OK Porsild draba              |
| Drrel | <i>Draba rectifruca</i>                 | OK                            |
| Drst2 | <i>Draba streptobrachia</i>             | OK                            |
| Drar  | <i>Drymocallis arguta</i>               | OK valley cinquefoil          |
| Drfi  | <i>Drymocallis fissa</i>                | OK rock cinquefoil            |
| Drgl  | <i>Drymocallis glandulosa</i>           | OK gland cinquefoil           |
| Duho  | <i>Dugaldia hoopesii</i>                | OK orange sneezeweed          |
| Ecan  | <i>Echinacea angustifolia</i>           | OK purple coneflower          |
|       | <i>Epilobium alpinum</i>                | = Epan                        |
| Epan2 | <i>Epilobium anagallidifolium</i>       | OK alpine willow-herb         |
|       | <i>Epilobium angustifolium</i>          | = Chan                        |
| Epci  | <i>Epilobium ciliatum</i>               | OK                            |
| Epho  | <i>Epilobium hornemannii</i>            | OK Hornemann willow-herb      |
| Eplal | <i>Epilobium lactiflorum</i>            | OK                            |
| Eple  | <i>Epilobium leptophyllum</i>           | OK                            |
|       | <i>Epilobium latifolium</i>             | = Chla                        |
| Epsa  | <i>Epilobium saximontanum</i>           | OK glandular willow-herb      |

|       |                                                |         |                         |
|-------|------------------------------------------------|---------|-------------------------|
| Eqar  | <i>Equisetum arvense</i>                       | OK      | field horsetail         |
|       | <i>Equisetum hyemale</i>                       | = Hihy  |                         |
|       | <i>Equisetum laevigatum</i>                    | = Hila  |                         |
|       | <i>Equisetum variegatum</i>                    | = Hiva  |                         |
| Erco6 | <i>Eremogone congesta</i>                      | OK      | ballhead sandwort       |
| Erfe  | <i>Eremogone fendleri</i>                      | OK      | Fendler sandwort        |
|       | <i>Erigeron acris</i>                          | = Erel  |                         |
| Erco1 | <i>Erigeron compositus</i>                     | ON      | fernleaf fleabane       |
| Erco4 | <i>Erigeron coulteri</i>                       | OK      | Coulter fleabane        |
| Erea  | <i>Erigeron eatonii</i>                        | OK      | Eaton fleabane          |
| Erel  | <i>Erigeron elatior</i>                        | OK      | tall fleabane           |
| Erel3 | <i>Erigeron elongatus</i>                      | OK      | bitter fleabane         |
| Eren  | <i>Erigeron engelmannii</i>                    | OK      | Engelmann fleabane      |
| Erex  | <i>Erigeron eximius</i>                        | OK      | forest fleabane         |
| Erfo  | <i>Erigeron formosissimus</i>                  | OK      | viscid fleabane         |
| Erg1  | <i>Erigeron glabellus</i>                      | OK      | smooth fleabane         |
| Ergr3 | <i>Erigeron grandiflorus</i>                   | OK      | largeflower daisy       |
| Erlo  | <i>Erigeron lonchophyllus</i>                  | OK      | spearleaf fleabane      |
| Ermel | <i>Erigeron melanocephalus</i>                 | OK      |                         |
| Erpel | <i>Erigeron peregrinus</i>                     | OK      | peregrine fleabane      |
| Erpi2 | <i>Erigeron pinnatisectus</i>                  | OK      | pinnate fleabane        |
| Ersil | <i>Erigeron simplex</i>                        | OK      | onestem fleabane        |
| Ersp  | <i>Erigeron speciosus</i>                      | OK      | Oregon fleabane         |
| Ersu  | <i>Erigeron subtrinnervis</i>                  | OK      | threenerve fleabane     |
|       | <i>Erigeron superbus</i>                       | = Erex  |                         |
| Erva  | <i>Erigeron vagus</i>                          | OK      | Bear River fleabane     |
| Erve  | <i>Erigeron vetensis</i>                       | OK      | La Veta fleabane        |
|       | <i>Eriogonum alatum</i>                        | = Ptal  |                         |
| Eran1 | <i>Eriogonum annuum</i>                        | OK      | annual buckwheat        |
| Erco7 | <i>Eriogonum coloradense</i>                   | OK      | Colorado buckwheat      |
| Eref  | <i>Eriogonum effusum</i>                       | OK      |                         |
| Erra  | <i>Eriogonum racemosum</i>                     | OK      | redroot buckwheat       |
| Ersu3 | <i>Eriogonum subalpinum</i>                    | OK      | subalpine buckwheat     |
| Erum  | <i>Eriogonum umbellatum</i>                    | OK      | sulfur buckwheat        |
| Eruma | <i>Eriogonum umbellatum</i> var. <i>aureum</i> | OK      | yellow sulfur buckwheat |
| Erar  | <i>Eritrichium aretioides</i>                  | OK      | alpine forget-me-not    |
| Eras  | <i>Erysimum asperum</i>                        | OK      | plains wallflower       |
| Erca5 | <i>Erysimum capitatum</i>                      | OK      | coast wallflower        |
| Ertr2 | <i>Erythrocoma triflora</i>                    | OK      | threeflowered avens     |
|       | <i>Eucephalus engelmannii</i>                  | = Asen  |                         |
| Euma2 | <i>Eupatorium maculatum</i>                    | OK      | Joe-Pye-weed            |
| Fiun  | <i>Filaginella uliginosa</i>                   | OK      | low cudweed             |
|       | <i>Fragaria ovalis</i>                         | = Frvio |                         |
| Frvel | <i>Fragaria vesca</i>                          | OK      | European strawberry     |
| Frvio | <i>Fragaria virginiana</i> ssp. <i>ovalis</i>  | OK      | wild strawberry         |
| Frsp  | <i>Frasera speciosa</i>                        | OK      | monument plant          |
| Gaar  | <i>Gaillardia aristata</i>                     | OK      | blanket-flower          |
| Gaap  | <i>Galium aparine</i>                          | OK      | catchweed bedstraw      |
|       | <i>Galium boreale</i>                          | = Gase  |                         |
| Gase  | <i>Galium septentrionale</i>                   | OK      | northern bedstraw       |
| Gatr1 | <i>Galium trifidum</i>                         | OK      | small bedstraw          |
| Gatr2 | <i>Galium triflorum</i>                        | OK      | sweetscented bedstraw   |
| Gadr  | <i>Gastrolychnis drummondii</i>                | OK      | Drummond campion        |
| Gaki  | <i>Gastrolychnis kingii</i>                    | OK      | King campion            |
| Gaco  | <i>Gaura coccinea</i>                          | OK      | scarlet gaura           |
| Geac  | <i>Gentiana acuta</i>                          | OK      | annual gentian          |
| Geal  | <i>Gentiana algida</i>                         | OK      | white gentian           |
|       | <i>Gentiana amarella</i> ssp. <i>acuta</i>     | = Geac  |                         |
| Geba  | <i>Gentiana barbellata</i>                     | OK      | bearded gentian         |
| Geca2 | <i>Gentiana calycosa</i>                       | OK      | pleated gentian         |
| Gepr  | <i>Gentiana prostrata</i>                      | OK      | low gentian             |
| Geca  | <i>Geranium caespitosum</i>                    | OK      | Fremont geranium        |



|       |                                                       |                           |
|-------|-------------------------------------------------------|---------------------------|
| Gecaa | <i>Geranium caespitosum</i> ssp. <i>atropurpureum</i> | OK                        |
|       | <i>Geranium fremontii</i>                             | = Geca                    |
| Geri  | <i>Geranium richardsonii</i>                          | OK Richardson geranium    |
| Gevi  | <i>Geranium viscosissimum</i>                         | OK sticky geranium        |
| Geall | <i>Geum aleppicum</i>                                 | OK Aleppo avens           |
| Gema  | <i>Geum macrophyllum</i>                              | OK largeleaf avens        |
| Geril | <i>Geum rivale</i>                                    | OK river avens            |
|       | <i>Geum rossii</i>                                    | = Acrot                   |
|       | <i>Geum triflorum</i>                                 | = Ertr                    |
|       | <i>Gilia aggregata</i>                                | = Ipag                    |
| Gica2 | <i>Gilia calcarea</i>                                 | OK sticky gilia           |
| Gile  | <i>Glycyrrhiza lepidota</i>                           | OK wild liquorice         |
|       | <i>Gnaphalium uliginosum</i>                          | = Fiun                    |
| Gore  | <i>Goodyera repens</i>                                | OK rattlesnake-plantain   |
|       | <i>Habenaria hyperborea</i>                           | = Lisa                    |
|       | <i>Habenaria viridis</i>                              | = Covi                    |
|       | <i>Halerpestes cymbalaria</i>                         | = Racy                    |
|       | <i>Haplopappus acaulis</i>                            | = Stac                    |
|       | <i>Haplopappus clementis</i>                          | = Pycl                    |
|       | <i>Haplopappus fremontii</i>                          | = Oofo                    |
|       | <i>Haplopappus macronema</i>                          | = Madi                    |
|       | <i>Haplopappus parryi</i>                             | = Orpa                    |
|       | <i>Haplopappus pygmaeus</i>                           | = Topy                    |
|       | <i>Haplopappus spinulosus</i>                         | = Mapi                    |
| Hatr  | <i>Harbouria trachypleura</i>                         | OK harbouria              |
| Hehi  | <i>Hedeoma hispida</i>                                | OK false-pennyroyal       |
| Heal  | <i>Hedysarum alpinum</i>                              | OK mountain sweet-vetch   |
|       | <i>Helenium hoopesii</i>                              | = Duho                    |
| Hequ  | <i>Helianthella quinquenervis</i>                     | OK fivenerve helianthella |
| Heun  | <i>Helianthella uniflora</i>                          | OK oneflower helianthella |
| Hepe  | <i>Helianthus petiolaris</i>                          | OK plains sunflower       |
| Hepu  | <i>Helianthus pumilus</i>                             | OK                        |
| Hemu  | <i>Helioneris multiflora</i>                          | OK showy goldeneye        |
|       | <i>Heracleum lanatum</i>                              | = Hesp                    |
| Hespm | <i>Heracleum sphondylium</i> ssp. <i>montanum</i>     | OK cow-parsnip            |
| Hefu  | <i>Heterotheca fulcrata</i>                           | OK                        |
| Hevi  | <i>Heterotheca villosa</i>                            | OK hairy goldenaster      |
| Hebr  | <i>Heuchera bracteata</i>                             | OK alumroot               |
| Hepa2 | <i>Heuchera parvifolia</i>                            | OK little-leaf alumroot   |
| Hife  | <i>Hieracium fendleri</i>                             | OK hawkweed               |
| Higr  | <i>Hieracium gracile</i>                              | OK slender hawkweed       |
| Hihy  | <i>Hippochaete hyemalis</i>                           | OK scouring-rush          |
| Hila  | <i>Hippochaete laevigata</i>                          | OK smooth horsetail       |
| Hiva  | <i>Hippochaete variegata</i>                          | OK variegated horsetail   |
| Hiplc | <i>Hirculus platysepalus</i> ssp. <i>crandallii</i>   | OK                        |
| Hyca  | <i>Hydrophyllum capitatum</i>                         | OK ballhead water-leaf    |
| Hyfe  | <i>Hydrophyllum fendleri</i>                          | OK Fendler water-leaf     |
|       | <i>Hymenoxys acaulis</i>                              | = Teac                    |
|       | <i>Hymenoxys grandiflora</i>                          | = Rygr                    |
| Hyre  | <i>Hypnum revolutum</i>                               | OK moss                   |
| Iplel | <i>Ipomoea leptophylla</i>                            | OK bush morning-glory     |
| Ipag  | <i>Ipomopsis aggregata</i>                            | OK skyrocket gilia        |
| Irm   | <i>Iris missouriensis</i>                             | OK Rocky Mtn. iris        |
| Ivgo  | <i>Ivesia gordonii</i>                                | OK Gordon ivesia          |
|       | <i>Kochia scoparia</i>                                | = Kosi                    |
| Kosil | <i>Kochia sieversiana</i>                             | OK summer-cypress         |
| Laob  | <i>Lactuca oblongifolia</i>                           | OK blue lettuce           |
| Lase  | <i>Lactuca serriola</i>                               | OK prickly lettuce        |
| Lare  | <i>Lappula redowskii</i>                              | OK stickseed              |
| Laar  | <i>Lathyrus arizonicus</i>                            | OK Arizona peavine        |
| Lale  | <i>Lathyrus leucanthus</i>                            | OK aspen peavine          |
| Laoc  | <i>Lathyrus ochroleucus</i>                           | OK cream peavine          |

|       |                                                     |        |                          |
|-------|-----------------------------------------------------|--------|--------------------------|
| Lepu  | <i>Leptodactylon pungens</i>                        | OK     | granite gilia            |
| Leal  | <i>Lesquerella alpina</i>                           | OK     | alpine bladderpod        |
| Lemo  | <i>Lesquerella montana</i>                          | OK     | low bladderpod           |
| Leer  | <i>Leucelene ericoides</i>                          | OK     | heath-aster              |
| Lemol | <i>Leucocrinum montanum</i>                         | OK     | sand-lily                |
| Lepy  | <i>Lewisia pygmaea</i>                              | OK     | least bitterroot         |
| Lipu  | <i>Liatris punctata</i>                             | OK     | dotted gayfeather        |
| Libil | <i>Lidia biflora</i>                                | OK     | alpine sandwort          |
| Liam  | <i>Ligularia amplexens</i>                          | OK     | showy alpine groundsel   |
| Libi2 | <i>Ligularia bigelovii</i>                          | OK     | Bigelow groundsel        |
| Liho  | <i>Ligularia holmii</i>                             | OK     | clasping groundsel       |
| Lipul | <i>Ligularia pudica</i>                             | OK     |                          |
| Liso  | <i>Ligularia soldanella</i>                         | OK     | singlehead groundsel     |
| Lita  | <i>Ligularia taraxacoides</i>                       | OK     | dandelion groundsel      |
| Lifi  | <i>Ligusticum filicinum</i>                         | OK     | fernleaf ligusticum      |
| Lipo  | <i>Ligusticum porteri</i>                           | OK     | Porter ligusticum        |
| Liph  | <i>Lilium philadelphicum</i>                        | OK     | wood lily                |
| Lisa  | <i>Limnorchis saccata</i>                           | OK     | northern green habenaria |
| Libo  | <i>Linnaea borealis</i>                             | OK     | twinflower               |
| Lile  | <i>Linum lewisii</i>                                | OK     | Lewis flax               |
| Liri  | <i>Linum rigidum</i>                                | OK     | stiffstem flax           |
| Liin  | <i>Lithospermum incisum</i>                         | OK     | cutleaf gromwell         |
| Limu  | <i>Lithospermum multiflorum</i>                     | OK     | many-flower gromwell     |
| Ilse  | <i>Lloydia serotina</i>                             | OK     | alp-lily                 |
| Loam  | <i>Lomatium ambiguum</i>                            | OK     | swale desert-parsley     |
| Lodi  | <i>Lomatium dissectum</i>                           | OK     | fernleaf biscuit-root    |
| Lopu  | <i>Lotus purshianus</i>                             | OK     | Spanish-clover           |
| Luarl | <i>Lupinus argenteus</i>                            | OK     | silvery lupine           |
| Lubaa | <i>Lupinus bakeri</i> ssp. <i>amplus</i>            | OK     |                          |
| Luca  | <i>Lupinus caudatus</i>                             | OK     | tailcup lupine           |
| Lupa3 | <i>Lupinus parviflorus</i>                          | OK     | lodgepole lupine         |
| Luse  | <i>Lupinus sericeus</i>                             | OK     | silky lupine             |
| Lyju  | <i>Lygodesmia juncea</i>                            | OK     | skeleton-plant           |
| Macal | <i>Machaeranthera canescens</i>                     | OK     | hoary aster              |
| Magr  | <i>Machaeranthera grindelioides</i>                 | OK     | Nuttall golden-weed      |
| Mapi  | <i>Machaeranthera pinnatifida</i>                   | OK     | ironplant golden-weed    |
| Madi  | <i>Macronema discoideum</i>                         | OK     | whitestem golden-weed    |
| Maca  | <i>Maianthemum canadense</i>                        | OK     | wild lily-of-the-valley  |
|       | <i>Melandium drummondii</i>                         | = Gadr |                          |
|       | <i>Melandrium kingii</i>                            | = Gaki |                          |
| Meal3 | <i>Mertensia alpina</i>                             | OK     | alpine bluebells         |
|       | <i>Mertensia bakeri</i>                             | = Mela |                          |
| Meci  | <i>Mertensia ciliata</i>                            | OK     | mountain bluebells       |
| Mefu  | <i>Mertensia fusiformis</i>                         | OK     | spindleroot bluebells    |
| Mela  | <i>Mertensia lanceolata</i>                         | OK     | lanceleaf bluebells      |
|       | <i>Mertensia viridis</i>                            | = Mela |                          |
| Miod  | <i>Micranthes odontoloma</i>                        | OK     | brook saxifrage          |
| Mirh  | <i>Micranthes rhomboidea</i>                        | OK     | diamond-leaf saxifrage   |
| Migu  | <i>Mimulus guttatus</i>                             | OK     | common monkey-flower     |
|       | <i>Minuartia biflora</i>                            | = Libi |                          |
|       | <i>Minuartia obtusiloba</i>                         | = Libi |                          |
|       | <i>Minuartia rubella</i>                            | = Trru |                          |
| Mipe  | <i>Mitella pentandra</i>                            | OK     | five-stamen miterwort    |
| Mists | <i>Mitella stauropetala</i> var. <i>stenopetala</i> | OK     | smallflower miterwort    |
| Moma  | <i>Moehringia macrophylla</i>                       | OK     | trailing sandwort        |
| Mofi  | <i>Monarda fistulosa</i>                            | OK     | beebalm                  |
| Mounl | <i>Moneses uniflora</i>                             | OK     | wood-nymph               |
| Muad  | <i>Muscaria adscendens</i>                          | OK     | wavyleaf saxifrage       |
| Nebr  | <i>Nemophila breviflora</i>                         | OK     | Great Basin menophila    |
| Nomo  | <i>Nocca montana</i>                                | OK     | mountain penny-cress     |
|       | <i>Notholeana fendleri</i>                          | = Chca |                          |
|       | <i>Oenothera serrulata</i>                          | = Case |                          |

|       |                                                |                          |
|-------|------------------------------------------------|--------------------------|
|       | <i>Oligosporus dranunculus</i>                 | = Ardr                   |
|       | <i>Oligosporus groenlandicus</i>               | = Argr                   |
| Oofo  | <i>Oenopsis foliosa</i>                        | OK Fremont goldenweed    |
|       | <i>Oreobroma pygmaea</i>                       | = Lipy                   |
| Orpa  | <i>Oreochrysum parryi</i>                      | OK Parry golden-weed     |
| Oralp | <i>Oreoxis alpina</i> ssp. <i>puberulenta</i>  | OK alpine oreoxis        |
| Orba  | <i>Oreoxis bakeri</i>                          | OK Baker oreoxis         |
| Orse  | <i>Orthilia secunda</i>                        | OK sidebells pyrola      |
| Orlu  | <i>Orthocarpus luteus</i>                      | OK yellow owl-clover     |
| OsSch | <i>Osmorhiza chilensis</i>                     | OK spreading sweetroot   |
| Osde  | <i>Osmorhiza depauperata</i>                   | OK bluntseed sweetroot   |
| Oxfe  | <i>Oxypolis fendleri</i>                       | OK Fendler cowbane       |
| Oxdi  | <i>Oxyria digyna</i>                           | OK alpine-sorrel         |
| Oxdef | <i>Oxytropis deflexa</i> var. <i>foliolosa</i> | OK drooped crazyweed     |
| Oxpo  | <i>Oxytropis podocarpa</i>                     | OK stalked-pod crazyweed |
| Oxse  | <i>Oxytropis sericea</i>                       | OK silky crazyweed       |
| Oxsp2 | <i>Oxytropis splendens</i>                     | OK : rwy crazyweed       |
|       | <i>Packera crocata</i>                         | = Secr                   |
|       | <i>Packera dimorphophylla</i>                  | = Sedi                   |
|       | <i>Packera fendleri</i>                        | = Sefe                   |
|       | <i>Packera neomexicana</i>                     | = Sene                   |
|       | <i>Packera werneriaefolia</i>                  | = Sewe                   |
| Papel | <i>Parietaria pensylvanica</i>                 | OK pellitory             |
| Pafi  | <i>Parnassia fimbriata</i>                     | OK Rocky Mtn. parnassia  |
| Paja  | <i>Paronychia jamesii</i>                      | OK James nailwort        |
| Papu  | <i>Paronychia pulvinata</i>                    | OK Rocky Mtn. nailwort   |
| Peb1  | <i>Pedicularis bracteosa</i>                   | OK bracted lousewort     |
| Peca4 | <i>Pedicularis canadensis</i>                  | OK early lousewort       |
| Pegr5 | <i>Pedicularis grayi</i>                       | OK Grays lousewort       |
| Pegr1 | <i>Pedicularis groenlandica</i>                | OK elephant-head         |
| Pepa4 | <i>Pedicularis parryi</i>                      | OK Parry lousewort       |
| Pera3 | <i>Pedicularis racemosa</i>                    | OK sickletop             |
| Pesc  | <i>Pedicularis scopulorum</i>                  | OK rock lousewort        |
| Peca2 | <i>Penstemon caespitosus</i>                   | OK mat penstemon         |
| Peha  | <i>Penstemon harbourii</i>                     | OK Harbour penstemon     |
| Pest  | <i>Penstemon strictus</i>                      | OK Rocky Mtn. penstemon  |
| Pete  | <i>Penstemon teucrioides</i>                   | OK Germander pepstemon   |
| Pev1  | <i>Penstemon virens</i>                        | OK green penstemon       |
| Pewh  | <i>Penstemon whippleanus</i>                   | OK Whipple penstemon     |
| Pega  | <i>Perideridia gairdneri</i>                   | OK yampa                 |
|       | <i>Petalostemon purpureum</i>                  | = Dapu                   |
|       | <i>Petalostemon villosus</i>                   | = Davi                   |
| Phhe  | <i>Phacelia heterophylla</i>                   | OK varileaf phacelia     |
| Phse  | <i>Phacelia sericea</i>                        | OK silky phacelia        |
| Phbr  | <i>Phlox bryoides</i>                          | OK moss phlox            |
| Phco  | <i>Phlox condensata</i>                        | OK dwarf tufted phlox    |
| Phho1 | <i>Phlox hoodii</i>                            | OK Hood phlox            |
| Phlo  | <i>Phlox longifolia</i>                        | OK longleaf phlox        |
| Phmu  | <i>Phlox multiflora</i>                        | OK flowery phlox         |
|       | <i>Phlox pulvinata</i>                         | = Phsi                   |
| Phsi  | <i>Phlox sibirica</i>                          | OK alpine phlox          |
| Phal2 | <i>Physaria alpina</i>                         | OK alpine twinpod        |
| Piop  | <i>Picradeniopsis oppositifolia</i>            | OK plains bahia          |
| Plpa  | <i>Plantago patagonica</i>                     | OK Indian-wheat          |
|       | <i>Plantago purshii</i>                        | = Plpa                   |
|       | <i>Pneumonanthe calycosa</i>                   | = Geca                   |
| Poea  | <i>Podistera eastwoodiae</i>                   | OK                       |
| Pocal | <i>Polemonium caeruleum</i>                    | OK Greek-valerian        |
|       | <i>Polemonium delicatum</i>                    | = Popud                  |
| Pofo  | <i>Polemonium foliosissimum</i>                | OK leafy polemonium      |
| Popul | <i>Polemonium pulcherrimum</i>                 | OK skunkleaf polemonium  |
| Povi  | <i>Polemonium viscosum</i>                     | OK sticky polemonium     |

|       |                                                       |         |                          |
|-------|-------------------------------------------------------|---------|--------------------------|
| Poal  | <i>Polygala alba</i>                                  | OK      | white polygala           |
| Poar4 | <i>Polygonum arenastrum</i>                           | OK      |                          |
|       | <i>Polygonum bistortoides</i>                         | = Bibi  |                          |
| Podol | <i>Polygonum douglasii</i>                            | OK      | Douglas knotweed         |
|       | <i>Polygonum viviparum</i>                            | = Bivi  |                          |
|       | <i>Potentilla glandulosa</i>                          | = Drgl  |                          |
|       | <i>Potentilla arguta</i>                              | = Drar  |                          |
| Poco2 | <i>Potentilla concinna</i>                            | OK      | elegant cinquefoil       |
| Podi  | <i>Potentilla diversifolia</i>                        | OK      | varileaf cinquefoil      |
|       | <i>Potentilla fissa</i>                               | = Drfi  |                          |
|       | <i>Potentilla glandulosa</i>                          | = Drgl  |                          |
| Pogr2 | <i>Potentilla gracilis</i>                            | OK      | northwest cinquefoil     |
| Pohi  | <i>Potentilla hippiana</i>                            | OK      | horse cinquefoil         |
| Poho  | <i>Potentilla hookeriana</i>                          | OK      | Hooker cinquefoil        |
| Poni  | <i>Potentilla nivea</i>                               | OK      | snowy cinquefoil         |
| Popu  | <i>Potentilla pulcherrima</i>                         | OK      | beauty cinquefoil        |
| Poru2 | <i>Potentilla rubricaulis</i>                         | OK      | arctic cinquefoil        |
| Posul | <i>Potentilla subjuga</i>                             | OK      | subpinnate cinquefoil    |
| Poun  | <i>Potentilla uniflora</i>                            | OK      | singleaflower cinquefoil |
| Prpa2 | <i>Primula parryi</i>                                 | OK      | Parry primrose           |
| Psmo  | <i>Pseudocymopterus montanus</i>                      | OK      | mountain parsley         |
| Psja  | <i>Pseudostellaria jamesiana</i>                      | OK      | tuber starwort           |
|       | <i>Psilochenia runcinata</i>                          | = Crru  |                          |
| Psar  | <i>Psoralea argophylla</i>                            | OK      | silverleaf scurfpea      |
| Psia  | <i>Psoralea lanceolata</i>                            | OK      | lemon scurfpea           |
|       | <i>Psychrophila leptosepala</i>                       | = Cale  |                          |
| Ptaq  | <i>Pteridium aquilinum</i>                            | OK      | bracken fern             |
| Ptal  | <i>Pterogonum alatum</i>                              | OK      | winged buckwheat         |
| Pupam | <i>Pulsatilla patens</i> ssp. <i>multifida</i>        | OK      | pasque-flower            |
| Pych  | <i>Pyrola chlorantha</i>                              | OK      | green pyrola             |
| Pymi  | <i>Pyrola minor</i>                                   | OK      | snowline pyrola          |
| Pyroa | <i>Pyrola rotundifolia</i> ssp. <i>asarifolia</i>     | OK      | roundleaf pyrola         |
|       | <i>Pyrola secunda</i>                                 | = Orse  |                          |
| Pycl  | <i>Pyrrocoma clementis</i>                            | OK      |                          |
| Raad  | <i>Ranunculus adoneus</i>                             | OK      | alpine buttercup         |
| Raal  | <i>Ranunculus alimaefolius</i>                        | OK      | plantain-leaf buttercup  |
| Raca  | <i>Ranunculus cardiophyllus</i>                       | OK      | hearleaf buttercup       |
| Racy  | <i>Ranunculus cymbalaria</i>                          | OK      | shore buttercup          |
| Raes  | <i>Ranunculus eschscholtzii</i>                       | OK      | subalpine buttercup      |
| Rahyl | <i>Ranunculus hyperboreus</i>                         | OK      | far-northern buttercup   |
| Rain  | <i>Ranunculus inamoenus</i>                           | OK      | unlovely buttercup       |
| Ramal | <i>Ranunculus macauleyi</i>                           | OK      | Macauley buttercup       |
| Rapel | <i>Ranunculus pedatifidus</i>                         | OK      | birdfoot buttercup       |
| Raun  | <i>Ranunculus uncinatus</i>                           | OK      | little buttercup         |
| Raco  | <i>Ratibida columnifera</i>                           | OK      | prairie coneflower       |
| Rhin  | <i>Rhodiola integrifolia</i>                          | OK      | rosy stonecrop           |
| Rocul | <i>Rorippa curvipes</i>                               | OK      |                          |
| Ropah | <i>Rorippa palustris</i> ssp. <i>hispida</i>          | OK      |                          |
| Rote  | <i>Rorippa teres</i>                                  | OK      |                          |
| Ruam  | <i>Rudbeckia ampla</i>                                | OK      | cutleaf coneflower       |
|       | <i>Rudbeckia laciniata</i> ssp. <i>ampla</i>          | = Ruam  |                          |
| Rudel | <i>Rumex densiflorus</i>                              | OK      |                          |
| Rusat | <i>Rumex salicifolius</i> ssp. <i>triangulivalvis</i> | OK      | mountain sorrel          |
| Rygr  | <i>Rydbergia grandiflora</i>                          | OK      | Rydbergia                |
| Sasa  | <i>Sagina saginoides</i>                              | OK      | arctic pearlwort         |
| Sala  | <i>Sagittaria latifolia</i>                           | OK      | common arrowhead         |
| Saru  | <i>Salicornia rubra</i>                               | OK      | Rocky Mtn. glasswort     |
| Saarl | <i>Salix arctica</i>                                  | OK      | arctic willow            |
|       | <i>Salix nivalis</i>                                  | = Saren |                          |
| Saren | <i>Salix reticulata</i> ssp. <i>nivalis</i>           | OK      | snow willow              |
| Sama  | <i>Sanicula marilandica</i>                           | OK      | black sanicle            |
|       | <i>Saxifraga adscendens</i>                           | = Muad  |                          |

|       |                                                       |                              |
|-------|-------------------------------------------------------|------------------------------|
|       | <i>Saxifraga arguta</i>                               | = Miod                       |
|       | <i>Saxifraga bronchialis</i> ssp. <i>austromontan</i> | = Cia                        |
| Sace  | <i>Saxifraga cernua</i>                               | OK nodding saxifrage         |
| Sahyd | <i>Saxifraga hyperborea</i> ssp. <i>debilis</i>       | OK pygmy saxifrage           |
|       | <i>Saxifraga odontoloma</i>                           | = Miod                       |
|       | <i>Saxifraga platysepalus</i> ssp. <i>crandallii</i>  | = Hiplc                      |
|       | <i>Saxifraga rhomboidea</i>                           | = Mirh                       |
| Scbrl | <i>Scutellaria brittonii</i>                          | OK Britton skullcap          |
|       | <i>Sedum integrifolium</i>                            | = Rhin                       |
| Sela  | <i>Sedum lanceolatum</i>                              | OK wormleaf stonecrop        |
|       | <i>Sedum rhodanthum</i>                               | = Clrh                       |
|       | <i>Sedum roseum</i>                                   | = Rhin                       |
|       | <i>Sedum stenopetalum</i>                             | = Sela                       |
| Sede  | <i>Selaginella densa</i>                              | OK selaginella               |
|       | <i>Senecio amplexens</i>                              | = Liam                       |
|       | <i>Senecio bigelovii</i>                              | = Libi                       |
| Secal | <i>Senecio canus</i>                                  | OK woolly groundsel          |
| Secr1 | <i>Senecio crassulus</i>                              | OK thickleaf groundsel       |
| Secr2 | <i>Senecio crocatus</i>                               | OK saffron groundsel         |
| Sedi  | <i>Senecio dimorphophyllus</i>                        | OK variflower groundsel      |
| Sefe  | <i>Senecio fendleri</i>                               | OK Fendler groundsel         |
| Sefrb | <i>Senecio fremontii</i> var. <i>blitoides</i>        | OK Fremont groundsel         |
|       | <i>Senecio holmii</i>                                 | = Liho                       |
| Sein1 | <i>Senecio integerrimus</i>                           | OK lambs-tongue groundsel    |
| Semu4 | <i>Senecio multilobatus</i>                           | OK lobeleaf groundsel        |
| Sene  | <i>Senecio neomexicanus</i>                           | OK New Mexico groundsel      |
| Sepl  | <i>Senecio plattensis</i>                             | OK prairie ragwort           |
|       | <i>Senecio pudicus</i>                                | = Lipu                       |
| Sese  | <i>Senecio serra</i>                                  | OK butterweed                |
|       | <i>Senecio soldanella</i>                             | = Liso                       |
| Sespl | <i>Senecio sphaerocephalus</i>                        | OK mountain-marsh butterweed |
| Sest  | <i>Senecio streptanthifolius</i>                      | OK cleft-leaf groundsel      |
|       | <i>Senecio taraxacoides</i>                           | = Lita                       |
| Setr  | <i>Senecio triangularis</i>                           | OK arrowleaf groundsel       |
| Sewe  | <i>Senecio werneriaefolius</i>                        | OK alpine groundsel          |
| Sewo  | <i>Senecio wootonii</i>                               | OK Wooton groundsel          |
| Sipr  | <i>Sibbaldia procumbens</i>                           | OK sibbaldia                 |
| Sica  | <i>Sidalcea candida</i>                               | OK white checker-mallow      |
| Siacs | <i>Silene acaulis</i> ssp. <i>subacaulescens</i>      | OK moss campion              |
| Sisch | <i>Silene scouleri</i> ssp. <i>hallii</i>             | OK Scouler campion           |
| Smca  | <i>Smelowskia calycina</i>                            | OK smelowskia                |
| Smam  | <i>Smilacina amplexicaulis</i>                        | OK feather solomon-plume     |
|       | <i>Smilacina racemosa</i>                             | = Smam                       |
| Smst  | <i>Smilacina stellata</i>                             | OK star solomon-plume        |
| Soca  | <i>Solidago canadensis</i>                            | OK Canada goldenrod          |
| Somi  | <i>Solidago missouriensis</i>                         | OK Missouri goldenrod        |
| Somus | <i>Solidago multiradiata</i> ssp. <i>scopolorum</i>   | OK northern goldenrod        |
| Sosp  | <i>Solidago sparsiflora</i>                           | OK fewflower goldenrod       |
| Sosp2 | <i>Solidago spathulata</i>                            | OK spoonleaf goldenrod       |
| Soar1 | <i>Sonchus arvensis</i>                               | OK field sow-thistle         |
| Span1 | <i>Sparganium angustifolium</i>                       | OK narrowleaf bur-reed       |
| Spcol | <i>Sphaeralcea coccinea</i>                           | OK scarlet globe-mallow      |
|       | <i>Stellaria jamesiana</i>                            | = Psja                       |
| Stla  | <i>Stellaria laeta</i>                                | OK                           |
| Stlo2 | <i>Stellaria longipes</i>                             | OK longstalk starwort        |
| Stum  | <i>Stellaria umbellata</i>                            | OK umbel starwort            |
| Stac  | <i>Stenotus acaulis</i>                               | OK stemless goldenweed       |
|       | <i>Streptopus amplexifolius</i>                       | = Stfa                       |
| Stfa  | <i>Streptopus fassettii</i>                           | OK twisted-stalk             |
| Suca  | <i>Suaeda calceoliformis</i>                          | OK seepweed                  |
|       | <i>Suaeda depressa</i>                                | = Suca                       |
| Sufrl | <i>Suaeda fruticosa</i>                               | OK seepweed                  |



|       |                                   |         |                         |
|-------|-----------------------------------|---------|-------------------------|
| Swpe  | <i>Swertia perennis</i>           | OK      | bog swertia             |
| Tapal | <i>Talinum parviflorum</i>        | OK      | prairie flame-flower    |
| Tace  | <i>Taraxacum ceratophorum</i>     | OK      | rough dandelion         |
| Taof  | <i>Taraxacum officinale</i>       | OK      | dandelion               |
| Teac  | <i>Tetranneuris acaulis</i>       | OK      | stemless actinea        |
| Thal1 | <i>Thalictrum alpinum</i>         | OK      | alpine meadow-rue       |
| Thfel | <i>Thalictrum fendleri</i>        | OK      | Fendler meadow-rue      |
| Thoc  | <i>Thalictrum occidentale</i>     | OK      | western meadow-rue      |
| Thsp  | <i>Thalictrum sparsiflorum</i>    | OK      | few-flower meadow-rue   |
| Thve  | <i>Thalictrum venulosum</i>       | OK      | veiny meadow-rue        |
| Thpal | <i>Thelypteris palustris</i>      | OK      | marsh fern              |
| Thdi  | <i>Thermopsis divaricarpa</i>     | OK      | spreading golden-banner |
| Thmol | <i>Thermopsis montana</i>         | OK      | mountain golden-banner  |
|       | <i>Thlaspi montanum</i>           | = Nomo  |                         |
| Topy  | <i>Tonestus pygmaeus</i>          | OK      | dwarf golden-weed       |
| Troc  | <i>Tradescantia occidentalis</i>  | OK      | prairie spiderwort      |
| Trca3 | <i>Trautvetteria carolinensis</i> | OK      | Carolina tassel-rue     |
| Trbr1 | <i>Trifolium brandegei</i>        | OK      | Brandegee clover        |
| Trda  | <i>Trifolium dasyphyllum</i>      | OK      | whiproot clover         |
| Trgy  | <i>Trifolium gymnocarpon</i>      | OK      | holly-leaf clover       |
| Trhy  | <i>Trifolium hybridum</i>         | OK      | alsike clover           |
| Trlo  | <i>Trifolium longipes</i>         | OK      | longstalk clover        |
| Trna  | <i>Trifolium nanum</i>            | OK      | dwarf clover            |
| Trpa  | <i>Trifolium parryi</i>           | OK      | Parry clover            |
| Trre  | <i>Trifolium repens</i>           | OK      | white clover            |
| Trma  | <i>Triglochin maritima</i>        | OK      | podgrass                |
| Tral3 | <i>Trollius albiflorus</i>        | OK      | globe-flower            |
|       | <i>Trollius laxus</i>             | = Tral  |                         |
| Trru  | <i>Tryphane rubella</i>           | OK      | boreal sandwort         |
| Tug1  | <i>Turritis glabra</i>            | OK      | tower-mustard           |
| Tyla  | <i>Typha latifolia</i>            | OK      | common cattail          |
|       | <i>Urtica dioica</i>              | = Ugrg  |                         |
| Ugrg  | <i>Urtica gracilis</i>            | OK      | nettle                  |
|       | <i>Valeriana acutiloba</i>        | = Vacaa |                         |
| Vaca2 | <i>Valeriana capitata</i>         | OK      | sharp-leaf valerian     |
| Vaed  | <i>Valeriana edulis</i>           | OK      | edible valerian         |
| Vaoc  | <i>Valeriana occidentalis</i>     | OK      | western valerian        |
|       | <i>Veratrum californicum</i>      | = Vete  |                         |
| Vete  | <i>Veratrum tenuipetalum</i>      | OK      | false-hellebore         |
|       | <i>Veratrum viride</i>            | = Vete  |                         |
| Veth  | <i>Verbascum thapsus</i>          | OK      | mullein                 |
| Veam  | <i>Veronica americana</i>         | OK      | American brooklime      |
| Venu  | <i>Veronica nutans</i>            | OK      | alpine speedwell        |
|       | <i>Veronica wormskjoldii</i>      | = Venu  |                         |
| Viam  | <i>Vicia americana</i>            | OK      | American vetch          |
|       | <i>Viguiera multiflora</i>        | = Hemu  |                         |
| Viad  | <i>Viola adunca</i>               | OK      | hook violet             |
| Vica  | <i>Viola canadensis</i>           | OK      | Canada violet           |
|       | <i>Viola epipsela ssp. repens</i> | = Viep  |                         |
| Viep  | <i>Viola epipseloides</i>         | OK      |                         |
| Vine  | <i>Viola nephrophylla</i>         | OK      | wanderer violet         |
|       | <i>Viola nuttallii</i>            | = Viva  |                         |
| Vipr  | <i>Viola pratincola</i>           | OK      | meadow violet           |
| Vipu3 | <i>Viola pubescens</i>            | OK      | common yellow violet    |
| Viva  | <i>Viola vallicola</i>            | OK      | Nuttall violet          |
| Vifa  | <i>Virgulus falcatus</i>          | OK      | little gray aster       |
| Ziel  | <i>Zigadenus elegans</i>          | OK      | mountain death-camas    |
| Ziap  | <i>Zizia aptera</i>               | OK      | zizia                   |
|       | <i>Zygadenus elegans</i>          | = Ziel  |                         |

### APPENDIX 3. NEW PLANT SPECIES NAMES IN EDITION 4

#### I. TREES AND SHRUBS

| <u>FORMER NAME</u>             | <u>NAME IN EDITION 4</u>                         |
|--------------------------------|--------------------------------------------------|
| <i>Alnus tenuifolia</i>        | <i>Alnus incana</i> ssp. <i>tenuifolia</i>       |
| <i>Arctostaphylos uva-ursi</i> | <i>Arctostaphylos adenotricha</i>                |
| <i>Berberis repens</i>         | <i>Mahonia repens</i>                            |
| <i>Betula occidentalis</i>     | <i>Betula fontinalis</i>                         |
| <i>Ceratoides lanata</i>       | <i>Eurotia lanata</i>                            |
| <i>Cornus stolonifera</i>      | <i>Swida sericea</i>                             |
| <i>Hymenoxys richardsonii</i>  | <i>Picradenia richardsonii</i>                   |
| <i>Lonicera involucrata</i>    | <i>Distegia involucrata</i>                      |
| <i>Opuntia arborescens</i>     | <i>Opuntia imbricata</i>                         |
| <i>Pachistima myrsinites</i>   | <i>Paxistima myrsinites</i>                      |
| <i>Populus deltoides</i>       | <i>Populus sargentii</i>                         |
| <i>Potentilla fruticosa</i>    | <i>Pentaphylloides floribunda</i>                |
| <i>Prunus virginiana</i>       | <i>Padus virginiana</i>                          |
| <i>Rhus radicans</i>           | <i>Toxicodendron rydbergii</i>                   |
| <i>Rhus trilobata</i>          | <i>Rhus aromatica</i> ssp. <i>trilobata</i>      |
| <i>Salix bebbiana</i>          | <i>Salix depressa</i>                            |
| <i>Salix planifolia</i>        | <i>Salix phylicifolia</i> ssp. <i>planifolia</i> |
| <i>Salix pseudolapponum</i>    | <i>Salix glauca</i>                              |
| <i>Vaccinium caespitosum</i>   | <i>Vaccinium cespitosum</i>                      |

#### II. GRAMINOIDS (GRASSES AND GRASSLIKES)

| <u>FORMER NAME</u>                             | <u>NAME IN EDITION 4</u>         |
|------------------------------------------------|----------------------------------|
| <i>Agropyron albicans</i>                      | <i>Elytrigia dasystachya</i>     |
| <i>Agropyron caninum</i>                       | <i>Elymus trachycaulus</i>       |
| <i>Agropyron dasystachyum</i>                  | <i>Elytrigia dasystachya</i>     |
| <i>Agropyron griffithsii</i>                   | <i>Elytrigia dasystachya</i>     |
| <i>Agropyron scribneri</i>                     | <i>Elymus scribneri</i>          |
| <i>Agropyron smithii</i>                       | <i>Elytrigia smithii</i>         |
| <i>Agropyron spicatum</i>                      | <i>Roegneria spicata</i>         |
| <i>Agropyron trachycaulum</i>                  | <i>Elymus trachycaulus</i>       |
| <i>Agrostis alba</i>                           | <i>Agrostis gigantea</i>         |
| <i>Agrostis scabra</i>                         | <i>Agrostis hyemalis</i>         |
| <i>Agrostis thurberiana</i>                    | <i>Podagrostis thurberiana</i>   |
| <i>Andropogon saccharoides</i>                 | <i>Bothriochloa saccharoides</i> |
| <i>Andropogon scoparius</i>                    | <i>Schizachyrium scoparium</i>   |
| <i>Avena hookeri</i>                           | <i>Helictotrichon hookeri</i>    |
| <i>Bromus anomalus</i>                         | <i>Bromus porteri</i>            |
| <i>Bromus ciliatus</i>                         | <i>Bromus canadensis</i>         |
| <i>Bromus inermis</i> ssp. <i>pumpellianus</i> | <i>Bromus pumpellianus</i>       |
| <i>Bromus marginatus</i>                       | <i>Bromus carinatus</i>          |
| <i>Calamagrostis inexpansa</i>                 | <i>Calamagrostis stricta</i>     |
| <i>Calamagrostis neglecta</i>                  | <i>Calamagrostis stricta</i>     |
| <i>Carex capitata</i> ssp. <i>arctogena</i>    | <i>Carex arctogena</i>           |
| <i>Carex crandallii</i>                        | <i>Carex pyrenaica</i>           |
| <i>Carex incurviformis</i>                     | <i>Carex maritima</i>            |
| <i>Carex rostrata</i>                          | <i>Carex utriculata</i>          |
| <i>Deschampsia caespitosa</i>                  | <i>Deschampsia cespitosa</i>     |
| <i>Eleocharis macrostachya</i>                 | <i>Eleocharis palustris</i>      |

|                                |                                               |
|--------------------------------|-----------------------------------------------|
| <i>Eleocharis pauciflora</i>   | <i>Eleocharis quinqueflora</i>                |
| <i>Elymus ambiguus</i>         | <i>Leymus ambiguus</i>                        |
| <i>Elymus cinereus</i>         | <i>Leymus cinereus</i>                        |
| <i>Festuca ovina</i>           | <i>Festuca brachyphylla</i>                   |
| <i>Hesperochloa kingii</i>     | <i>Leucopoa kingii</i>                        |
| <i>Hierochloa odorata</i>      | <i>Hierochloa hirta</i>                       |
| <i>Juncus balticus</i>         | <i>Juncus arcticus</i>                        |
| <i>Koeleria cristata</i>       | <i>Koeleria macrantha</i>                     |
| <i>Panicum oligosanthos</i>    | <i>Dichanthelium oligosanthos</i>             |
| <i>Panicum scribnerianum</i>   | <i>Dichanthelium oligosanthos</i>             |
| <i>Panicum wilcoxianum</i>     | <i>Dichanthelium wilcoxianum</i>              |
| <i>Phleum alpinum</i>          | <i>Phleum commutatum</i>                      |
| <i>Poa interior</i>            | <i>Poa nemoralis</i> ssp. <i>interior</i>     |
| <i>Poa pattersonii</i>         | <i>Poa abbreviata</i> ssp. <i>pattersonii</i> |
| <i>Poa rupicola</i>            | <i>Poa glauca</i>                             |
| <i>Poa sandbergii</i>          | <i>Poa secunda</i>                            |
| <i>Puccinellia nuttalliana</i> | <i>Puccinellia airoides</i>                   |
| <i>Sitanion hystrix</i>        | <i>Elymus elymoides</i>                       |
| <i>Sitanion longifolium</i>    | <i>Elymus longifolius</i>                     |
| <i>Sorghastrum nutans</i>      | <i>Sorghastrum avenaceum</i>                  |
| <i>Stipa columbiana</i>        | <i>Stipa nelsonii</i>                         |
| <i>Stipa occidentalis</i>      | <i>Stipa nelsonii</i> & <i>S. lettermanii</i> |

### III. FORBS

| FORMER NAME                    | NAME IN EDITION 4                   |
|--------------------------------|-------------------------------------|
| <i>Achillea millefolium</i>    | <i>Achillea lanulosa</i>            |
| <i>Anemone patens</i>          | <i>Pulsatilla patens</i>            |
| <i>Antennaria alpina</i>       | <i>Antennaria media</i>             |
| <i>Aquilegia caerulea</i>      | <i>Aquilegia coerulea</i>           |
| <i>Arabis demissa</i>          | <i>Arabis oxylobula</i>             |
| <i>Arabis glabra</i>           | <i>Turritis glabra</i>              |
| <i>Arabis holboellii</i>       | <i>Arabis retrofracta</i>           |
| <i>Arenaria congesta</i>       | <i>Eremogone congesta</i>           |
| <i>Arenaria fendleri</i>       | <i>Eremogone fendleri</i>           |
| <i>Arenaria obtusiloba</i>     | <i>Lidia biflora</i>                |
| <i>Artemisia borealis</i>      | <i>Artemisia groenlandicus</i>      |
| <i>Aster arenosus</i>          | <i>Leucelene ericoides</i>          |
| <i>Aster canescens</i>         | <i>Machaeranthera canescens</i>     |
| <i>Aster commutatus</i>        | <i>Virgulus falcatus</i>            |
| <i>Aster ericoides</i>         | <i>Leucelene ericoides</i>          |
| <i>Aster falcatus</i>          | <i>Virgulus falcatus</i>            |
| <i>Bahia oppositifolia</i>     | <i>Picradeniopsis oppositifolia</i> |
| <i>Chrysopsis villosa</i>      | <i>Heterotheca villosa</i>          |
| <i>Cicuta maculata</i>         | <i>Cicuta douglasii</i>             |
| <i>Cryptogramma crispa</i>     | <i>Cryptogramma acrostichoides</i>  |
| <i>Delphinium nelsonii</i>     | <i>Delphinium nuttallianum</i>      |
| <i>Epilobium alpinum</i>       | <i>Epilobium anagallidifolium</i>   |
| <i>Epilobium angustifolium</i> | <i>Chamerion angustifolium</i>      |
| <i>Epilobium latifolium</i>    | <i>Chamerion latifolium</i>         |
| <i>Equisetum hyemale</i>       | <i>Hippochaete hyemale</i>          |
| <i>Equisetum laevigatum</i>    | <i>Hippochaete laevigatum</i>       |
| <i>Equisetum variegatum</i>    | <i>Hippochaete variegatum</i>       |
| <i>Erigeron acris</i>          | <i>Erigeron elatior</i>             |
| <i>Erigeron superbus</i>       | <i>Erigeron eximius</i>             |
| <i>Eriogonum alatum</i>        | <i>Pterogonum alatum</i>            |

*Fragaria ovalis*  
*Galium boreale*  
*Gentiana amarella*  
*Geranium fremontii*  
*Geum rossii*  
*Geum triflorum*  
*Gilia aggregata*  
*Gnaphalium uliginosum*  
*Habenaria hyperborea*  
*Habenaria viridis*  
*Haplopappus acaulis*  
*Haplopappus clementis*  
*Haplopappus fremontii*  
*Haplopappus macronema*  
*Haplopappus parryi*  
*Haplopappus pygmaeus*  
*Haplopappus spinulosus*  
*Helenium hoopesii*  
*Heracleum lanatum*  
*Hymenoxys acaulis*  
*Hymenoxys grandiflora*  
*Kochia scoparia*  
*Melandrium kingii*  
*Mertensia bakeri*  
*Mertensia viridis*  
*Minuartia biflora*  
*Minuartia obtusiloba*  
*Petalostemon purpureum*  
*Petalostemon villosus*  
*Phlox pulvinata*  
*Plantago purshii*  
*Polemonium delicatum*  
*Polygonum bistortoides*  
*Polygonum viviparum*  
*Potentilla arguta*  
*Potentilla fissa*  
*Potentilla glandulosa*  
*Pyrola secunda*  
*Rudbeckia laciniata*  
*Salix nivalis*  
*Saxifraga arguta*  
*Saxifraga bronchialis*  
*Saxifraga odontoloma*  
*Saxifraga rhomboidea*  
*Sedum integrifolium*  
*Sedum rhodanthum*  
*Sedum roseum*  
*Sedum stenopetalum*  
*Senecio amplexans*  
*Senecio bigelovii*  
*Senecio holmii*  
*Senecio soldanella*  
*Smilacina racemosa*  
*Stellaria jamesiana*  
*Streptopus amplexicaulis*  
*Suaeda depressa*  
*Thlaspi montanum*

*Fragaria virginiana*  
*Galium septentrionale*  
*Gentiana acuta*  
*Geranium caespitosum*  
*Acomastylis rossii*  
*Erythrocoma triflora*  
*Ipomopsis aggregata*  
*Filaginella uliginosa*  
*Limnorchia saccata*  
*Coeloglossum viridis*  
*Stenotus acaulis*  
*Pyrrocoma clementis*  
*Oonopsis foliosa*  
*Macronema discoidea*  
*Oreochrysum parryi*  
*Tonestus pygmaeus*  
*Machaeranthera pinnatifida*  
*Dugaldia hoopesii*  
*Heracleum sphondylium*  
*Tetraneuris acaulis*  
*Rydbergia grandiflora*  
*Kochia sieversiana*  
*Gastrolychnis kingii*  
*Mertensia lanceolata*  
*Mertensia lanceolata*  
*Lidia biflora*  
*Lidia obtusiloba*  
*Dalea purpurea*  
*Dalea villosa*  
*Phlox sibirica*  
*Plantago patagonica*  
*Polemonium pulcherrimum*  
*Bistorta bistortoides*  
*Bistorta viviparum*  
*Drymocallis arguta*  
*Drymocallis fissa*  
*Drymocallis glandulosa*  
*Orthilia secunda*  
*Rudbeckia ampla*  
*Salix reticulata* spp. *nivalis*  
*Micranthes odontoloma*  
*Ciliaria austromontana*  
*Micranthes odontoloma*  
*Micranthes rhomboidea*  
*Rhodiola integrifolia*  
*Clementsia rhodantha*  
*Rhodiola integrifolia*  
*Sedum lanceolatum*  
*Ligularia amplexans*  
*Ligularia bigelovii*  
*Ligularia holmii*  
*Ligularia soldanella*  
*Smilacina amplexicaulis*  
*Pseudostellaria jamesiana*  
*Streptopus fassettii*  
*Suaeda calceoliformis*  
*Nocca montana*

*Trollius laxus*  
*Urtica dioica*  
*Valeriana acutiloba*  
*Veratrum californicum*  
*Veratrum viride*  
*Veronica wormskjoldii*  
*Viguiera multiflora*  
*Viola epipsela*  
*Viola nuttallii*  
*Zygadenus elegans*

*Trollius albiflorus*  
*Urtica gracilis*  
*Valeriana capitata*  
*Veratrum tenuipetalum*  
*Veratrum tenuipetalum*  
*Veronica nutans*  
*Heliomeris multiflora*  
*Viola epipseloides*  
*Viola vallicola*  
*Zigadenus elegans*



# APPENDIX 4. NEW AND CHANGED PLANT ASSOCIATIONS IN EDITION 4

## I. CONIFEROUS FORESTS

| FORMER CODE             | CODE IN EDITION 4                        | REASON/COMMENTS                    |
|-------------------------|------------------------------------------|------------------------------------|
| Abco-Psme/Acgl ph. Alte | Abco-Psme/Acgl ph. Alint                 | Species name change.               |
|                         | Abco-Psme/Amal                           | New p.a.                           |
| Abco-Psme/Aruv          | Abco-Psme/Arad                           | Ditto.                             |
|                         | Abco-Psme/Arpa3                          | Ditto.                             |
|                         | Abco-Pifl/Fearl                          | New p.a.                           |
|                         | Abco-Psme/Juco                           | Ditto.                             |
|                         | Abco-Psme/Mare                           | Ditto.                             |
|                         | Abco-Psme/Phma                           | Ditto.                             |
| Abco-Psme/Quga ph. Muvi |                                          | Deleted; not in R-2.               |
|                         | Abco-Psme/Quga ph. Gatr2                 | New phase.                         |
|                         | Abco-Psme/Quga ph. Pamy                  | New phase.                         |
|                         | Abco-Psme/Syorl                          | New p.a.                           |
|                         | Abla-Mare                                | Ditto.                             |
|                         | Abla/Thfel                               | Ditto.                             |
|                         | Abla-Pienl/Caru                          | New to R-2                         |
|                         | Abla-Pifl/Mare ph. Pamy                  | New phase.                         |
|                         | Abla-Pienl/Pamy ph. Psme<br>and ph. Rimo | New phases.                        |
|                         | Abla-Pienl/Phma                          | New p.a.                           |
|                         | Abla-Pienl/RIBE ph. Thfel                | New phase.                         |
|                         | Abla-Pienl/Vace                          | New to R-2.                        |
|                         | Pienl/Feth                               | New p.a.                           |
| Pienl/Gatr2             | Pienl-Pipu/Gatr2                         | Blue spruce codom.                 |
| Pienl/Juco              | Pienl-Psme/Juco                          | Douglas-fir codom.                 |
|                         | Pienl/Vace                               | New p.a.                           |
|                         | Pigl/Libo                                | New p.a.                           |
| Pipu/Alte               | Pipu/Alint                               | Species name change.               |
| Pipu-Psme/Aruv          | Pipu-Psme/Arad                           | Ditto.                             |
|                         | Pipu-Psme/Fearl ph. Dapal                | New phase.                         |
|                         | Pipu-Psme/Juco                           | New p.a.                           |
|                         | Pipu-Psme/Mare                           | New p.a.                           |
|                         | Pial/Juco ph. Shca                       | New phase.                         |
|                         | Piar/Juco                                | New p.a.                           |
| Pico/Aruv               | Pico/Arad                                | Species name change.               |
| Pico/Arco2              |                                          | Not in R-2                         |
|                         | Pico/Vace                                | New p.a.                           |
| Pifl/Agsp               | Pifl/Rosp                                | Species name change.               |
|                         | Pifl/Cele                                | New p.a.                           |
|                         | Pifl/Feth                                | New p.a.                           |
| Pifl/Heki               | Pifl/Leki                                | Species name change.               |
|                         | Pifl/Juho                                | New p.a.                           |
|                         | Pifl/Pavi                                | New p.a.                           |
| Pipo/Agsm-Agsp          | Pipo/Rosp                                | Realigned, closer to Pfister 1977; |
|                         |                                          | species name change.               |
| Pipo/Ansc               | Pipo/Scsc                                | Species name change.               |
| Pipo/Ansc-Agsm          | Pipo/Scsc-Elsm                           | Species name changes.              |
| Pipo-Jusc/Agsp          | Pipo-Jusc/Rosp                           | Species name change.               |
| Pipo/Aruv               | Pipo/Arad                                | Ditto.                             |
|                         | Pipo/Arpa3 ph. Cemo                      | New phase.                         |
|                         | Pipo/Arno                                | New p.a.                           |
|                         | Pipo/Cele                                | New p.a.                           |
| Pipo/Cemo ph. Fearl     |                                          | Error of listing.                  |

|                           |                                            |                                                                                                   |
|---------------------------|--------------------------------------------|---------------------------------------------------------------------------------------------------|
| Pipo/Fear1 ph. Quga       | Pipo-Jusc/Cemo                             | New p.a.                                                                                          |
| Pipo/Heki                 | Pipo/Leki                                  | See Pipo/Quga, Fear1.                                                                             |
| Pipo-Psme/Mumol ph. Aggr1 | Pipo-Psme/Mumol ph. Eida                   | Species name change.                                                                              |
|                           |                                            | Ditto.                                                                                            |
| Pipo-Quma/Prvi-Syal       | Pipo/Pavi                                  | Realigned; species name change; phases Quma and Ange created for Black Hills; also see Pipo/Quma. |
|                           | Pipo/Quma                                  | New p.a.                                                                                          |
|                           | Pipo/Syal ph. Oras & Mare                  | Two new phases.                                                                                   |
|                           | Psme/Amal                                  | New p.a.                                                                                          |
| Psme/Aruv-Juco            | Psme/Arad-Juco                             | Species name change.                                                                              |
|                           | Psme/Cele                                  | New p.a.                                                                                          |
|                           | Psme/Putr                                  | New p.a.                                                                                          |
|                           | Psme/Syor1 ph. Mare, Cagel, Leki, and Rosp | New phases.                                                                                       |

## II. DECIDUOUS FORESTS

| FORMER CODE                   | CODE IN EDITION 4     | REASONS/COMMENTS                                                         |
|-------------------------------|-----------------------|--------------------------------------------------------------------------|
|                               | Bepa/Cocol            | New p.a.                                                                 |
| Frpe/Syoc-Prvi                | Frpe/Pavi & Frpe/Syoc | Split; new info.                                                         |
| Osvi/Bepa                     |                       | Not confirmed.                                                           |
|                               | Osvi-Quma/sparse      | New p.a.                                                                 |
|                               | Poan3/Alint-Swse      | New p.a.                                                                 |
| Poan3/Phmo-Prvi               | Poan3/Phmo-Pavi       | Species name change.                                                     |
| Poan3-Pien1/Loin1             | Poan3-Pien1/Diin      | Species name change.                                                     |
|                               | Poba/Swse             | New p.a.                                                                 |
| Posa/Syoc-Elci                | Posa/Syoc-Leci        | Species name change.                                                     |
|                               | Posa/Syoc-Saex        | New p.a.                                                                 |
| Posa-Powi-Pofr2/<br>Saam-Saex |                       | Dropped; too general; eventually will be replaced by p.a.'s in 3 series. |
| Potr1/Amal-Prvi               | Potr1/Amal-Pavi       | Species name change.                                                     |
|                               | Potr1/Arad            | New p.a.                                                                 |
|                               | Potr1/Cocol ph. Ptaq  | New phase.                                                               |
|                               | Potr1/Cocol ph. Arnul | New phase.                                                               |
|                               | Potr1/Fear1           | New p.a.                                                                 |
|                               | Potr1/Pavi            | New p.a., n Great Plains                                                 |
|                               | Potr1/Sara            | New p.a.                                                                 |
| Quma/Juvi                     |                       | Listed in error.                                                         |
|                               | Quga/CORY3            | New; new data.                                                           |

## III. WOODLANDS

|                 |                 |                      |
|-----------------|-----------------|----------------------|
|                 | Jumo/Elsm       | New p.a.             |
|                 | Juos/Mafr       | New p.a.             |
| Juos-Pied/Agspi | Juos-Pied/Rospi | Species name change. |
| Jusc/Agsm       | Jusc/Elsm       | Ditto.               |
| Jusc/Agsp       | Jusc/Rosp       | Ditto.               |
|                 | Jusc/Ormi       | New p.a.             |
|                 | Pied/Arno       | New p.a.             |
|                 | Pied-Jumo/Cemo  | New p.a.             |
|                 | Pied-Juco/Stnel | New p.a.             |

# IV. SHRUBLANDS

| FORMER CODE         | CODE IN EDITION 4       | REASONS/COMMENTS                |
|---------------------|-------------------------|---------------------------------|
| Alte-Befo           | Alint                   | Species name change.            |
|                     | Acgl/Swse               | New p.a.                        |
|                     | AMEL-Putr/Rosp          | New p.a.                        |
| Amal-Syor1/Thfe1    | Amal-Pavi/Viam          | Renamed, on better data.        |
| Arar3/Agsp          | Arar3/Rosp              | Species name change.            |
| Arca3/Agsm          | Arca3/Elsm              | Ditto.                          |
|                     | Arca3-Syoc/Elsm         | New p.a.                        |
| Arlo3/Agsm          | Arlo3/Elsm              | Species name change.            |
| Arno/Agsp           | Arno/Rosp               | Ditto.                          |
| Artr/Aggr1          |                         | See Artr-Putr/Elda.             |
| Artr/Agsm           | Artr/Elsm               | Species name change.            |
| Artr/Agsp           | Artr/Rosp               | Ditto.                          |
| Artr/Elam           | Artr/Leam               | Ditto.                          |
| Artr/Elci           | Artr/Leci               | Ditto.                          |
| Artr/Heki           | Artr/Leki               | Ditto.                          |
| Artr/Poag           |                         | Deleted; species misidentified. |
| Artr-Putr/Aggr1     | Artr-Putr/Elda          | Species name change.            |
| Artr-Putr/Agsm      | Artr-Putr/Elsm          | Ditto.                          |
|                     | Artr/Spcr               | New p.a.                        |
| Artr/Stoc           | Artr/Stnel              | Species name change.            |
| Artr1/Posal         | Artr1/Pose              | Ditto.                          |
|                     | Atca/Elsm-Bogr          | New p.a.                        |
|                     | Atca-Artr/Elsm          | New p.a.                        |
|                     | Atca/Stcol              | New p.a.                        |
| Atco-Artr/Agsp      | Atco-Artr/Rosp          | Species name change.            |
|                     | Atga/Elsm               | New p.a.                        |
|                     | Begl/Casc2 & Begl/Popul | New p.a.'s.                     |
| Cele/Agsp           | Cele/Rosp               | Species name change.            |
| Cemo/Aggr1          | Cemo/Elda               | Ditto.                          |
| Cemo/Agsp           | Cemo/Rosp               | Ditto.                          |
| Cemo/Rhtr           | Cemo-Rhart/Bocu         | Renamed.                        |
|                     | Cemo-Rhart/Ange         | New p.a.                        |
| Cemo/Stcol ph. Rhtr | Cemo/Stcol ph. Rhart    | Species name change.            |
| Cemo/Stoc           | Cemo/Stle               | Ditto.                          |
|                     | Diin/Caca               | New p.a.                        |
|                     | Droc/Saren              | New p.a.                        |
|                     | Eula/Hija               | New p.a.                        |
|                     | Hodu/Feth & Hodu/Rice   | New p.a.'s                      |
|                     | Juco-RIBE/Feth          | New p.a.                        |
|                     | Juho/Cahel & Juho/Scsc  | New p.a.'s.                     |
|                     | Pavi-Syoc/Elsm          | New p.a.                        |
|                     | Pavi-Syor1/Eltr         | New p.a.                        |
| Pofrl               | Pefl                    | Species name change.            |
|                     | Pefl/Ciau & Pefl/Dece   | New p.a.'s.                     |
| Pofrl/Frov-Popul    |                         | Deleted; seral to Pefl/Feth.    |
|                     | Pefl/Feth               | New p.a.                        |
|                     | Pera2-Syor1/Mare        | New p.a.                        |
| Putr/Agsp           | Putr/Rosp               | Species name change.            |
|                     | Putr-Artr/Rosp          | New p.a.                        |
|                     | Quga/Cahel              | New p.a.                        |
|                     | Quga-Pavi/Feth          | New p.a.                        |
| Quga-Prvi/Pamy      | Quga-Pavi/Pamy          | Species name change.            |

|                  |                          |                                                  |
|------------------|--------------------------|--------------------------------------------------|
| Quga/Syor1-AMEL  | Quga/Syor1 & Quga/Amel   | Split based on new data; old p.a. was too large. |
| Rhtr             | Rhart                    | Species name change.                             |
| Rhtr/Agsp        | Rhart/Cafi & Rhart/Mumol | New p.a.'s.                                      |
|                  | Rhart/Rosp               | Species name changes.                            |
|                  | Rice/Feid & Rimo/Popul   | New p.a.'s                                       |
|                  | Ruid/Hepa2               | New p.a.                                         |
| Saam-Sap1/Ashe   | Saam-Saphp/Ashe          | Species name change.                             |
|                  | Sabo                     | 2 new p.a.'s                                     |
|                  | Saca6-SALI/Caaq          | New p.a.                                         |
|                  | Sadr/Caca                | New p.a.                                         |
| Sage-Salu/Caut   | Sage-SALI/Caut           | Other spp. involved.                             |
| Savi/Gerol       | Sag11/Acro               | Species name changes.                            |
| Sag11-Sabr1/Deca | Sag11-Sabr1/Dece         | Ditto.                                           |
|                  | Salu/Eqar                | New p.a.                                         |
| Sap1             | Saphp                    | Species name change.                             |
| Sap1/Caca        |                          | Dropped; seral to Saphp/Dece.                    |
| Sap1/Deca        | Saphp/Dece               | Species name changes.                            |
|                  | Sawo                     | 5 new p.a.'s.                                    |
| Save2-Artr/Agsm  | Save2-Artr/Elsm          | Species name change.                             |
|                  | Save2/Rosp               | New p.a.                                         |
|                  | Save2-Atco/Eltr          | New p.a.                                         |
| Save2/Atga       | Save2-Atga/Pose          | Renamed, based on new data.                      |
| Save2/Elci       | Save2/Leci               | Species name change.                             |
|                  | Swse                     | 3 new p.a.'s                                     |
|                  | Syoc/Elsm                | New p.a.                                         |
|                  | Vace/Bltr                | New p.a.                                         |

#### V. GRASSLANDS

| FORMER CODE          | CODE IN EDITION 4      | REASONS/COMMENTS      |
|----------------------|------------------------|-----------------------|
| Agsm                 | Elsm                   | Species name change.  |
|                      | Elsm/Bogr ph. Stcol    | New phase.            |
|                      | Elsm/Bogr ph. Stvi     | New phase.            |
|                      | Elsm/Cafi & Elsm/Cahel | 2 new p.a.'s.         |
| Agsm/Dist            | Elsm/Disp              | Species name changes. |
| Agsp                 | Rosp                   | Ditto.                |
| Agsp/Agsm            | Rosp/Elsm              | Ditto.                |
|                      | Rosp/Bocu              | New p.a.              |
|                      | Rosp/Cafi & /Pofe      | New p.a.'s            |
| Agsp/Posal           | Rosp/Pose              | Species name change.  |
| Agsp/Posal ph. Stcol | Rosp/Stcol             | Renamed.              |
| Ange/Ansc            | Ange/Scsc              | Ditto.                |
|                      | Ange/Diols             | New p.a.              |
| Ange/Sonu            | Ange/Soav              | Species name change;  |
|                      |                        | 2 new phases.         |
|                      | Ange/Sphe              | New p.a.              |
|                      | Anha/Calo ph. Scsc     | New phase.            |
| Ansc                 | Scsc                   | Species name change.  |
|                      | Scsc/Bohi              | New p.a.              |
|                      | Scsc/Cafi ph. Stcol    | New phase.            |
|                      | Scsc/STIP              | New p.a.              |
| Bocu/Ansc            | Bocu/Scsc              | Ditto.                |
| Bogr/Agsm            | Bogr/Elsm              | Ditto.                |
| Bogr/Arfri           |                        | Dropped; not climax.  |

|                     |                            |                                                 |
|---------------------|----------------------------|-------------------------------------------------|
|                     | Bogr/Cael1                 | New p.a.                                        |
|                     | Bogr/Stcol                 | 3 new phases.                                   |
| Bohi/Bogr           |                            | Dropped, poorly documented.                     |
| Buda/Agsm           | Buda/Elsm                  | Species name change.                            |
| Buda/Cahel          | Buda/CARE                  | Renamed; several <i>Carex</i> species involved. |
|                     | Capu                       | 2 new p.a.'s.                                   |
|                     | Calo/Bogr                  | New p.a.                                        |
| Calo/Cafi           |                            | Dropped; seral to Calo/Stcol.                   |
|                     | Calo/Cahel                 | New p.a.                                        |
|                     | Calo/Stcol ph. Bogr        | New phase.                                      |
|                     | Caaq/Cahol                 | New p.a.                                        |
| Caar3/Mibi3         | Caar3/Libi                 | Species name change.                            |
| Cael/Gerol          | Cael/Acro                  | Ditto.                                          |
|                     | Cael & Caen                | 3 new p.a.'s.                                   |
| Cafo/Gerol          | Cafo/Acro                  | Species name change.                            |
|                     | Cam14 & Cana               | 2 new p.a.'s.                                   |
|                     | Cane/Dece                  | New p.a.                                        |
|                     | Capr1/Caaq                 | New p.a.                                        |
| Capy/Judr           | Capy/Erme                  | Renamed, based on better data.                  |
|                     | Capy/moss                  | New p.a.                                        |
| Caru/Miob           | Caru/Libi                  | Species name change.                            |
|                     | Caru/Komy                  | New p.a.                                        |
| Caru/Miob ph. Gerol |                            | See Acro/Caru.                                  |
|                     | Caru/Phs1                  | New p.a.                                        |
| Casc2/Sein2-Serh    | Casc2/Cale1                | Renamed, based on better data.                  |
|                     | Casc2/Bibi, /Dece, & /moss | 3 new p.a.'s.                                   |
| Casc2/Gerol         | Casc2/Acro                 | Species name change.                            |
|                     | Casi/Dece                  | New p.a.                                        |
|                     | Caaq1/Caaq                 | New p.a.                                        |
|                     | Dain/Dece & Dain/Stle      | 2 new p.a.'s.                                   |
|                     | Dapa1/Cahel ph. Scsc       | New phase.                                      |
|                     | Dapa1/Fear1                | New p.a.                                        |
| Deca                | Dece                       | Species name change.                            |
| Deca/Gerol          | Dece/Acro                  | Species name changes.                           |
|                     | Dece/Eltr & Dece/Judr      | New p.a.'s                                      |
| Dist                | Disp                       | Species name change.                            |
| Dist/Agsm           | Disp/Elsm                  | Species name changes.                           |
| Dist/Spai-Agsm      | Disp/Spai-Elsm             | Ditto.                                          |
| Elmal1/CARE         | Elpa/CARE                  | Ditto.                                          |
| Fear1/Feth          |                            | Deleted; combined with Feth/Fear1.              |
|                     | Fear1/Cahel                | New p.a.                                        |
| Feid/Agca           |                            | Deleted; see /Eltr.                             |
| Feid/Agca ph. Gevi  |                            | Deleted; see /Gevi.                             |
| Feid/Agsm           | Feid/Elsm                  | Species name change.                            |
| Feid/Agsp           | Feid/Rosp                  | Ditto.                                          |
| Feid/Agtrl          | Feid/Eltr                  | Ditto.                                          |
| Feid/Deca           | Feid/Dece                  | Ditto.                                          |
| Feid/Heki           | Feid/Leki                  | Ditto.                                          |
| Feid/Pofe           |                            | Deleted; poorly documented.                     |
|                     |                            | Deleted; see /Leki.                             |
| Feid/Pofe ph. Heki  |                            | New p.a.                                        |
|                     | Feth/Oral                  |                                                 |



|                 |                                     |                                                            |
|-----------------|-------------------------------------|------------------------------------------------------------|
| Juba/CARE       | Hija/Spai<br>Juar/CARE              | New p.a.<br>Species name change;<br>2 new phases added.    |
|                 | Juar/Disp<br>Judr/Sipr              | New p.a.<br>New p.a.                                       |
| Komy/Gerol-Caru | Komy/Acro-Caru<br>Kosi/Bivi         | Species name change.<br>New p.a.                           |
| Mucu/Ansc       | Mucu/Scsc                           | Species name change.                                       |
| Mumol/Aggr1     | Mumol/Elda<br>Mumol/Mela            | Ditto.<br>New p.a.                                         |
| Pone2/Stoc      | Poar2/Bivi                          | New p.a.                                                   |
| Pofe/Agsp       | Pone2/Stle                          | Species name change.<br>Deleted; v.Rosp/Pofe.              |
|                 | Puai/Trma<br>SCIR/Disp              | New p.a.<br>New p.a.                                       |
| Spai/Agsp       | Sppel/Caca<br>Spai/Elsm             | New p.a.<br>Species name change.                           |
| Spas/Ansc       | Spai/Bogr<br>Spas/Scsc              | New p.a.<br>Ditto.                                         |
| Stcol/Aggr1     | Sphe/Stsp                           | New p.a.                                                   |
| Stcol/Agsm      | Stcol/Elda                          | Species name change.<br>Deleted; v.Elsm/Bogr<br>ph. Stcol. |
|                 | Stcol/Bogr ph. Stsp                 | New phase.                                                 |
| Stcol/Cage1     | Stcol/Bohi, /Caeb, /Caell           | New p.a.'s<br>Deleted; poorly<br>documented.               |
|                 | Stcol/Cahel<br>Stsp/Ang & Stsp/Mucu | New p.a. & 2 phases.<br>New p.a.'s.                        |

# VI. FORBLANDS

| FORMER CODE      | CODE IN EDITION 4                         | REASONS/COMMENTS                                    |
|------------------|-------------------------------------------|-----------------------------------------------------|
| Ana1/Poar2       | Anme/Poar2                                | Species name change.                                |
| Arar4/Trpa-Miob  | Arar4/Trpa-Libi                           | Ditto.                                              |
| Cale1/Serh       | Cale1/Clrh                                | Ditto.                                              |
| Cisc/Aqca        | Cisc/Aqco                                 | Ditto.                                              |
| Gerol            | Clme/Siac<br>Acro                         | New p.a.<br>Species name change.                    |
| Gerol/TRIF-Deca  | Acro/Caru & Acro/Trma<br>Acro/TRIF-Deca   | New p.a.'s.<br>Species name change.                 |
| Meci/Deca        | Ivgo/Erfe                                 | New p.a.                                            |
| Papu/Miob        | Meci/Dece                                 | Species name change.                                |
| Prpa2/Deca       | Papu/Libi                                 | Ditto.                                              |
| SALI/Gerol-Saren | Phsi/Trda<br>Povi/Erpe                    | New p.a.<br>New p.a.                                |
|                  | Prpa2/Dece                                | Species name change.                                |
|                  | Saren/Acro & Saar/Acro &<br>their phases. | Broken up into<br>several p.a.'s as<br>too general. |
|                  | Saren/Vace                                | New p.a.                                            |
|                  | Saar/Erme & Saar/Trpa                     | New p.a.'s                                          |
|                  | Ciau/Cyfe                                 | New p.a.                                            |
| Saod/Deca        | Saod/Dece                                 | Species name change.                                |
| Sipr/Miob-moss   | Seat/Phhe                                 | New p.a.                                            |
|                  | Sipr/Libi-moss                            | Species name change.                                |
|                  | Sipr/Caeb                                 | New p.a.                                            |
| Trda/Agps        | Trda/Elsc                                 | Species name change.                                |

|                 |                 |                      |
|-----------------|-----------------|----------------------|
| Trda/Miob       | Trda/Libi       | Ditto.               |
| Trpa/Gero1      | Trna/Libi       | New p.a.             |
|                 | Trpa/Acro       | Species name change. |
|                 | Trpa/Dece       | New p.a.             |
| Trla-Lifi/Erpel | Tral-Lifi/Erpel | Species name change. |
|                 | Vete/Hesp       | New p.a.             |

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APPENDIX 5. SUMMARY OF CLASSIFICATION HIERARCHY, REGION 2

- I. PLAINS GRASSLAND
  - 01. Tallgrass Prairie
    - A. Nebraska Sandhills
    - B. Bluestem Prairie
  - 02. Northern Mixed-grass (Midgrass) Prairie
    - A. Wheatgrass-Needlegrass
    - B. Bluestem-Grama Prairie
    - C. Wheatgrass-Bluestem Prairie
  - 03. Shortgrass Prairie
    - A. Grama-Needlegrass-Wheatgrass
    - B. Grama-Buffalograss
    - C. Grama-Galleta
  - 04. Sandy Prairie
    - A. Sand Sagebrush Prairie
    - B. Sandy Grassland
- II. PLAINS RIPARIAN, FLOODPLAINS, AND OTHER WATER-DOMINATED COMMUNITIES
  - 05. Fresh-Water Riparian Grasslands
  - 06. Salt Flats
  - 07. Plains Deciduous Woody Riparian
    - A. Plains Cottonwood
    - B. Ash-Elm-Maple Bottoms
    - C. Oak and Birch
- III. FOOTHILL AND MOUNTAIN GRASSLANDS
  - 08. Palouse Prairie
    - A. Fescue-Wheatgrass
    - B. Wheatgrass-Bluegrass
    - C. Foothills Prairie
  - 09. Fescue Mountain and Foothill Grasslands
    - A. Rough and Idaho Fescue
    - B. Thurber Fescue
    - C. Arizona Fescue and Muhly
  - 10. Colorado Subalpine Grassland
  - 11. Mountain Riparian Grassland
    - A. Tufted Hairgrass and Reedgrass Wet Meadows
    - B. Sedge Wet Meadows
- IV. WOODLAND
  - 12. Coniferous Woodland
    - A. Juniper-Pinyon Woodland
    - B. Juniper Steppe Woodland
  - 13. Tall Evergreen Shrub Woodland
- V. COLD DESERT SHRUBLANDS
  - 14. Desert Alluvial Salt Shrub
    - A. Saltbush and Shadscale
    - B. Greasewood
  - 15. Sagebrush
    - A. Great Basin Low Sagebrush
    - B. Basin Big Sagebrush
    - C. Mountain and Eastern Foothills Sagebrush
- VI. MOUNTAIN AND FOOTHILLS MIXED SHRUBLAND
  - 16. Deciduous Green Shrubland
    - A. Gambel Oak
    - B. Serviceberry and Chokecherry
    - C. Snowberry
    - D. Mountain-Mahogany and Skunkbrush

17. Mountain Riparian Shrub
  - A. Foothills and Plains Riparian Shrub
  - B. Montane Riparian Shrub
  - C. Subalpine Riparian Shrub
18. Rocky Slopes, Scree, and Cliffs
  - A. Mountain Rocks, Scree, and Cliffs
  - B. Plains, Desert, and Foothills Rocks, Scree, and Cliffs
- VII. MOUNTAIN CONIFEROUS FORESTS (ROCKY MOUNTAIN)
  19. Foothills and Plains Coniferous Forests
    - A. Eastern Ponderosa Forest
    - B. Black Hills Pine Forest
  20. Montane Coniferous Forest
    - A. Northwestern Ponderosa Forest
    - B. Douglas-fir Forest
    - C. Colorado and Southwestern Ponderosa Pine
    - D. Colorado and Southwestern Douglas-fir
    - E. Southwestern White Fir
    - F. Blue Spruce Uplands
    - G. Blue Spruce Riparian
    - H. Engelmann and White Spruce
    - I. Ponderosa Shrub Forest
  21. Montane and Subalpine Pine Forests
    - A. Limber Pine Forest
    - B. Bristlecone Pine Forest
    - C. Lodgepole Pine Forest
    - D. Whitebark Pine Forest
  22. Subalpine Forest
    - A. Western Spruce-Fir Forest
    - B. Southwestern Spruce-Fir Forest
- VIII. MOUNTAIN DECIDUOUS FORESTS
  23. Aspen
    - A. Rocky Mountain Aspen
    - B. Canadian, Plains, and Black Hills Aspen
  24. Mountain Deciduous Riparian Forest
- IX. ALPINE GRASSLANDS AND FORBLANDS
  25. Alpine Grasslands
  26. Alpine Uplands, Windscars, and Early Snowmelt Areas
  27. Bog-Marsh Forblands and Late Snowmelt Areas

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#### DESCRIPTIONS OF HIGHER CLASSIFICATION UNITS

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I. PLAINS GRASSLAND FORMATION. Clements 1920, Costello 1954, Garrison et al. 1977; "True Prairie" (Weaver and Clements 1929)

01. Tallgrass prairie. Shantz 1938, McArdle and Costello 1938, Risser et al. 1981, Branson 1985; "Subclimax prairie, *Andropogon* associates" (Clements 1920); "*Andropogon* [*gerardii*]-*Stipa* assn." (Gates 1940); "Prairie" (Benson 1957); "True prairie" (Aikman 1935, Eyre 1963, Dodd 1968, Garrison et al. 1977, Coupland 1979); "*Andropogon scoparius* steppe" (Daubenmire 1978)

Series.

|                            |                                      |
|----------------------------|--------------------------------------|
| <i>Andropogon gerardii</i> | <i>Sporobolus heterolepis</i> (part) |
| <i>Andropogon hallii</i>   | <i>Stipa spartea</i> (part)          |
| <i>Sporobolus asper</i>    |                                      |

Climate and Landform. Plains and rolling hills on low-angle slopes, sometimes on gentle lower slopes of rolling hills, deep soils, high precipitation and heat in growing season, favoring growth of warm-season grasses.

Physiognomy. Bunchgrass prairie, with many species of other, shorter grasses and forbs. Appearance can be strikingly different in spring and early summer, before growth of dominant (warm-season) grasses.

Distribution. Central Saskatchewan, Manitoba, and eastern Alberta through North Dakota and South Dakota, to Nebraska, southeastern Wyoming, northeastern Colorado, Kansas, and Oklahoma. The best development of this in this Region is in the sandhills of central and northern Nebraska.

Subdivisions.

A. Nebraska sandhills. Kuchler 1964 [No. 75]; "Sand dune assn." (Gates 1940)

Anha/Calo

B. Bluestem prairie. Kuchler 1964 [No. 74]; "[Schizachyrium] scoparium[m] assn." (Gates 1940); "Bluejoint sod (northern part)" (Shantz 1938)

Ange/Scsc Ange/Sphe Sphe/Stsp

Ange/Diols Spas/Scsc

Ange/Soav Stsp/Ange

02. Northern Mixed-grass (Midgrass) Prairie. Costello 1954, Eyre 1963, Dodd 1968, Risser et al. 1981, Singh et al. 1983; "Mixed Prairie" (Clements 1920, Weaver and Clements 1929, Aikman 1935, Coupland 1979); "Needle-and-thread, junegrass, and slender wheatgrass" (Shantz 1938)

Series.

Bouteloua curtipendula Sporobolus airoides

Elytrigia smithii (part) Sporobolus heterolepis (part)

Muhlenbergia cuspidata Stipa comata (part)

Schizachyrium scoparium Stipa spartea (part)

Climate and Landform. Rolling gentle hills and plains, hot in summer but humidity and summer precipitation lower than for Tallgrass Prairie. Moderately deep soils.

Physiognomy. Bunchgrass prairie. There is not usually the conspicuous difference between early and late summer; by midsummer the community has achieved its usual appearance.

Distribution. Southern Saskatchewan and Alberta to central and eastern Montana, western North Dakota, eastern Wyoming, western South Dakota and Nebraska, northeastern Colorado, central Kansas and Oklahoma. There is an apparent outlier in the Red Desert of southwestern Wyoming.

Subdivisions.

A. Wheatgrass-Needlegrass. Kuchler 1964 [No. 66]; Kaul 1986 [No. 4]

Elsm/Elac Stcol/Cael Stcol/Cahel

Elsm/Stvi Stcol/Cafi Stcol/Elda

B. Bluestem-grama prairie. Kuchler 1964 [No. 69]; "Little bluejoint-bunchgrass" (Shantz 1938)

Bocu/Scsc Scsc/Bogr Scsc/STIP

Mucu/Scsc Scsc/Bohi Stsp/Mucu

Scsc/Bocu Scsc/Cafi



C. Wheatgrass-bluestem Prairie. Kaul 1986 [No. 6];  
"Wheatgrass-bluestem-needlegrass" (Kuchler 1964 [No. 67])

Spai/Elsm Sphe/CARE

03. Shortgrass Prairie. Weaver and Clements 1929, Shantz 1938, McArdle and Costello 1938, Costello 1954, Risser et al. 1981 Singh et al. 1983; "Buchloe-Bouteloua assn." (Gates 1940); "Bouteloua gracilis steppe" (Daubenmire 1978); "Shortgrass plains" (Aikman 1935)

Series.

Bouteloua gracilis Buchloe dactyloides

Climate and Landform. Hot and dry, with summer precipitation low; winter precipitation limited by rainshadow effect from mountains to west. Soils deep to shallow, with large clay fraction, often hard, "tight," or with claypan. Height of plants, both grasses and forbs, may be strikingly dependent on summer rains.

Physiognomy. Shortgrass plains and flats, plants often average less than 6 in tall.

Distribution. Southern Alberta and Saskatchewan, central and eastern Montana, western North Dakota, central and western South Dakota, eastern Wyoming, western Nebraska, eastern Colorado, western Kansas, the panhandles of Texas and Oklahoma, and northeastern New Mexico.

Subdivisions.

A. Grama-needlegrass-wheatgrass Shantz 1938, Kuchler 1964 [No. 64], Kaul 1986 [No. 1]; "Blue grama, buffalo grass, and bluestem" (Stantz 1938); "Bluestem" (Shantz 1938)

|            |            |           |
|------------|------------|-----------|
| Bogr/Cael  | Bogr/STIP  | Buda/Elsm |
| Bogr/Elsm  | Bogr/Stcol | Elsm/Bogr |
| Bogr/Eulal | Buda/CARE  | Elsm/Cafi |

B. Grama-buffalograss Shantz 1938, Kuchler 1964 [No. 65], Kaul 1986 [No. 3]

Bogr/Buda

C. Grama-galleta. Kuchler 1964 [No. 53]; "Desert grasslands" (Garrison et al. 1977 [no. 40], in part)

Bogr/Bocu Bogr/Mufil

04. Sandy Prairie. Gates 1940

Series.

Artemisia filifolia Stipa comata (part)

Calamovilfa longifolia

Climate and Landform. Hot and dry, as in Shortgrass Prairie. Soils sandy but not often in blowouts.

Physiognomy. Medium-height shrubland, with conspicuous tallgrasses interspersed, and a lower layer of short and mid-grasses and forbs.

Distribution. Same as Shortgrass Prairie. Sand sagebrush sites are often developed on sand that has been deposited by wind and water just south of and overlooking major river floodplains.

Subdivisions.

A. Sand sagebrush prairie. Costello 1954, Kuchler 1964 [No. 70], Kaul 1986 [No. 7]; "Sandgrass, sand sage" (Shantz 1938)

Arfi/Anha Arfi/Spcr-Bogr

B. Sandy GrasslandCalo/Bogr  
Calo/CalhCalo/Spgr  
Calo/Stcol

Stcol/Bohl

II. PLAINS RIPARIAN, FLOODPLAINS, OTHER WATER-DOMINATED COMMUNITIES05. Fresh-Water Riparian Grasslands. "Spartina pectinata assn." (Gates 1940); "Tule Marshes" (Kuchler 1964 [No. 49])Series.

|                                 |                    |
|---------------------------------|--------------------|
| Calamagrostis canadensis (part) | Spartina pectinata |
| Phragmites communis             | Typha spp.         |
| Scirpus spp.                    |                    |

Climate and Landform. Riparian bottoms and marshes, where fresh water is available to shallow roots through most of season. Significant precipitation during middle to late summer.

Physiognomy. Tall grasses and grasslike plants, not strongly bunchgrass but rather forming a dense thicket with a variety of tall forbs.

Distribution. Saskatchewan and Manitoba to central North Dakota, South Dakota, Nebraska, and northeastern Kansas.

No subdivisions.

|            |           |           |
|------------|-----------|-----------|
| Caca/Casa2 | Scam/CARE | Sppe/Caca |
| Phco/Calal | SCIR/Disp | Tyla/Sala |

06. Salt Flats. "Distichlis assn." (Gates 1940)Series.

|                          |                      |
|--------------------------|----------------------|
| Distichlis spicata       | Puccinellia airoides |
| Elytrigia smithii (part) | Suaeda spp.          |
| Juncus spp. (part)       |                      |

Climate and Landform. Depressions and low places in the plains, where salt is accumulating or has accumulated. Water is available during at least some of the growing season, but the source could be ground-water rather than directly falling as precipitation. Soils more or less saline.

Physiognomy. Medium- to short-grasses of mixed species, sometimes with salt-loving forbs mixed or dominant.

Distribution. Not apparently correlated with climate, but rather occurring in isolated sites not only throughout the Great Plains, but also in intermountain valleys at higher elevations, and in isolated sites in the Great Basin. Limiting factors are apparently not climate, but rather water supply and salty soil.

No subdivisions.

|                |           |           |
|----------------|-----------|-----------|
| Disp/Elsm      | Elsm/Disp | SUAE/Saru |
| Disp/Puai      | Juar/Disp |           |
| Disp/Spai-Elsm | Puai/Trma |           |

07. Plains Deciduous Woody Riparian. "Northern Floodplain Forest" (Kuchler 1964 [No. 98]); "Black Hills Pine Forest--Eastern Foothills" (Kuchler 1964 [No. 17], in part); "Elm-ash-cottonwood" (Garrison et al. 1977 [no. 17])

Series.

|                        |                               |
|------------------------|-------------------------------|
| Fraxinus pennsylvanica | Populus sargentii (deltoides) |
| Ostrya virginiana      | Populus wislizenii            |
| Populus fremontii      | Populus balsamifera           |
|                        | Quercus macrocarpa            |

Climate and Landform. Draw bottoms with intermittent streams, to floodplains of larger rivers. Fresh water, usually in unbound form, must be available year-round. Therefore, these are often in climates with noticeable precipitation during the growing season.

Physiognomy. Medium-height trees to large trees, with several shrub layers (when in good condition).

Distribution. Western North Dakota and central Montana through eastern Wyoming, western and central South Dakota and central Nebraska, to northeastern Colorado, western Kansas, and the panhandle country.

Subdivisions.

A. Plains Cottonwood. "Populus-Salix assn." (Gates 1940)

|                |                |                 |
|----------------|----------------|-----------------|
| Poba/Swse      | Posa/Syoc-Saex | Posa/Riam       |
| Posa/Syoc-Leci | Posa/SALI      | Posa-Poan3/SALI |

B. Ash-Elm-Maple Bottoms.

|           |                  |
|-----------|------------------|
| Frpe/Pavi | Osvi/Crsu        |
| Frpe/Syoc | Osvi-Quma/sparse |

C. Oak and Birch.

|            |            |           |
|------------|------------|-----------|
| Bepa/Cocol | Quma/CORY3 | Quma/Syoc |
|------------|------------|-----------|

III. FOOTHILL AND MOUNTAIN GRASSLANDS. "Bunchgrass Steppe" (Risser et al. 1981); "Mountain grasslands" (Garrison et al. 1977 [no. 36])

08. Palouse prairie. Weaver and Clements 1929, Eyre 1963, Dodd 1968, Coupland 1979, Kaul 1986 [No. 2]; "Wheatgrass sod" (Shantz 1938); "Pacific bunchgrass" (McArdle and Costello 1938); "Agropyron spicatum steppe" in part (Daubenmire 1978)

Series.

Festuca idahoensis (part) Roegneria spicata

Climate and Landform. Cold winters and hot summers, generally in rainshadow areas, but with some precipitation coming during growing season. Rolling hills and prairies, foothills, and lower intermountain valleys.

Physiognomy. Bunchgrass steppe, with most of the dominant climax grasses bunched. Forbs are usually more conspicuous at earlier seral stages.

Distribution. Eastern Washington and Oregon to southern Idaho and western Wyoming; eastern foothills of the Rocky Mountains and intermountain valleys on the east side from Alberta and Saskatchewan to central and south-central Colorado. Apparently disjunct on the high plateaus of west-central Colorado.

Subdivisions.

A. Fescue-wheatgrass. Kuchler 1964 [No. 50], in part  
Feid/Rosp

B. Wheatgrass-bluegrass. Kuchler 1964 [No. 51]  
Rosp/Pose

C. Foothills prairie. Kuchler 1964 [No. 63]; "Wheatgrass bunch" (Shantz 1938)

|           |            |             |
|-----------|------------|-------------|
| Rosp/Bocu | Rosp/Elsm  | Stcol/Bogr  |
| Rosp/Bogr | Rosp/Pofe  | Stcol/Mumol |
| Rosp/Cafi | Rosp/Stcol |             |

09. Fescue Mountain and Foothill Grasslands. Dodd 1968; "Fescue prairie" (Coupland 1979)

Series.

|                                  |                             |
|----------------------------------|-----------------------------|
| <i>Danthonia parryi</i>          | <i>Festuca thurberi</i>     |
| <i>Festuca arizonica</i>         | <i>Ligusticum porteri</i>   |
| <i>Festuca idahoensis</i> (part) | <i>Muhlenbergia montana</i> |
| <i>Festuca scabrella</i>         |                             |

Climate and Landform. Warm summers, cold winters, usually with noticeable precipitation coming as winter snow. Usually large parks or openings alternating with ponderosa pine-Douglas-fir forest, spruce-fir forest, or white fir or blue spruce forest. Low to moderate slopes, usually with deeper, less-rocky soil than the surrounding forests, often on broad ridgetops.

Physiognomy. Medium-height bunchgrass steppe, with a few forbs noticeable at climax; earlier seral stages have more forbs.

Distribution. Medium and lower elevations of the Rocky Mountains, and some intermountain valleys, from British Columbia and Alberta through Montana, Idaho, and western Wyoming to central and southern Utah and north-central New Mexico.

Subdivisions.

A. Rough and Idaho fescue. (Kuchler 1964 [No. 50], "Fescue-wheatgrass," in part)

|            |           |           |
|------------|-----------|-----------|
| Dapal/Feid | Feid/Eltr | Feid/Luse |
| Feid/Cahel | Feid/Elsm | Feid/Trsp |
| Feid/Caob  | Feid/Gevi | Fesc/Feid |
| Feid/Dece  | Feid/Leki |           |

B. Thurber fescue.

|            |                |           |
|------------|----------------|-----------|
| Feth/Dapal | Feth/Oral      | Lipo/Viam |
| Feth/Fearl | Feth/Viam-Lale |           |
| Feth/Feid  | Lipo/Lupa3     |           |

C. Arizona fescue and muhly.

|             |             |             |
|-------------|-------------|-------------|
| Dapal/Cahel | Fearl/Mumol | Mumol/Bltr  |
| Dapal/Fearl | Mufil/Arfri | Mumol/Fearl |
| Fearl/Cahel | Mumol/Elda  | Mumol/Mela  |

10. Colorado Subalpine Grassland

Series.

|                                   |                            |
|-----------------------------------|----------------------------|
| <i>Calamagrostis purpurascens</i> | <i>Poa</i> spp.            |
| <i>Danthonia intermedia</i>       | <i>Stipa comata</i> (part) |

Climate and Landform. Cold climate, with high snowfall, relatively high summer precipitation. Thin, rocky soils, often on upper slopes and ridges.

Physiognomy. Medium to tall bunchgrasses, with a wide variety of tall forbs mixed.

Distribution. High mountains of Colorado and southern Wyoming.

No Subdivisions.

|           |           |            |
|-----------|-----------|------------|
| Capu/Hemo | Dain/Ersi | Stcol/Caeb |
| Capu/Pogl | Dain/Podi |            |
| Dain/Dece | Dain/Stle |            |

11. Mountain Riparian Grassland. "Mountain meadows" (Garrison et al. 1977 [no. 37])

Series.

|                          |                              |
|--------------------------|------------------------------|
| Calamagrostis canadensis | Carex simulata               |
| Carex aquatilis          | Catabrosa aquatica           |
| Carex microglochin       | Deschampsia cespitosa (part) |
| Carex microptera         | Eleocharis spp.              |
| Carex nebrascensis       | Juncus spp. (part)           |
| Carex praeceptorum       | Mertensia ciliata            |
| Carex scopulorum         |                              |

Climate and Landform. Fresh-water swamps and bottoms where soil is poorly-drained, but where water is available throughout the growing season. Cold winters, with considerable snowfall, most of the yearly precipitation coming then. Cool summers with some precipitation as rain in late summer. Valley and canyon bottoms and depressions.

Physiognomy. Grasses and grasslike plants, not forming apparent bunches. A few forbs are present at climax; considerably more at earlier seral stages. Sediment production in watershed above site and/or trampling use by animals may cause downcutting of stream and consequent drying out of the site; then most wet grasses will be replaced by dryer-site grasses and forbs.

Distribution. Throughout the Rocky Mountains and adjacent ranges, at middle to upper elevations.

Subdivisions.

A. Tufted Hairgrass and Reedgrass Wet Meadows.

|                 |            |           |
|-----------------|------------|-----------|
| Caca-Casc2/Meci | Casi/Dece  | Dece/Eltr |
| Cami4/Dece      | Dece/Cale1 | Meci/Dece |
| Cane/Dece       | Dece/CARE  |           |

B. Sedge Wet Meadows.

|                 |            |           |
|-----------------|------------|-----------|
| Caaq/Caut       | Caaq1/Caaq | Judr/CARE |
| Caaq/Cahol      | Elpa/CARE  |           |
| Cane/Caaq1-Juar | Juar/CARE  |           |

IV. WOODLAND Clements 1920, Weaver and Clements 1929, Eyre 1963; Piñon-cedar belt (Rydberg 1916)

12. Coniferous Woodland "Pygmy Forest"; "Pinyon-juniper" (McArdle and Costello 1938, Billings 1951, Garrison et al. 1977); "Juniper-piñon" (Shantz 1938, Daubenmire 1943)

Series.

|                       |                      |
|-----------------------|----------------------|
| Juniperus monosperma  | Pinus edulis         |
| Juniperus osteosperma | Juniperus scopulorum |

Climate and Landform. Hot and dry, slopes and flats, precipitation low to very low; soils shallow, rocky, well-drained to excessively well-drained. The sites are poorly productive of trees, shrubs, or herbaceous vegetation.

Physiognomy. Open-canopy forest of small trees with rounded crowns. Sometimes an open layer of medium-height shrubs is present, otherwise a sparse herbaceous layer.

Distribution. Southwestern North Dakota, south-central South Dakota, north-central and southeastern Wyoming, central Idaho, and eastern Oregon, through Utah, Nevada, Colorado, northeastern Arizona, New Mexico, and panhandle country of Texas and Oklahoma, western Texas, Chihuahua, and Sonora.



Subdivisions.

A. Juniper-Pinyon Woodland. Weaver and Clements 1929, Costello 1954, Benson 1957, Kuchler 1964 [No. 23]

|                |                |                 |
|----------------|----------------|-----------------|
| Jumo/Bocu      | Juos/Mafr      | Pied-Jumo/Cemo  |
| Jumo/Bogr      | Juos/Orhy      | Pied-Juos/Cemo  |
| Jumo/Elsm      | Pied-Juos/Artr | Pied-Juos/Pofe  |
| Juos-Pied/Rosp | Pied-Juos/Amut | Pied-Juos/Putr  |
| Juos/Artr      | Pied/Arno      | Pied/Quga       |
| Juos/Cemo      | Pied/Bogr      | Pied-Jumo/Stnel |

B. Juniper Steppe Woodland. Kuchler 1964 [No. 24]

|           |           |           |
|-----------|-----------|-----------|
| Jusc/Artr | Jusc/Elsm | Jusc/Putr |
| Jusc/Cemo | Jusc/Ormi | Jusc/Rosp |

13. Tall Evergreen Shrub Woodland "Mountain-mahogany-oak scrub" (Kuchler 1964 [No. 37], in part)

Series.

Cercocarpus ledifolius

Climate and Landform. Hot and dry summers, cool winters. Steep slopes to very steep slopes, with excessively-drained soils.

Physiognomy. Open to very open canopy of tall shrubs to small trees, often with a grassy undergrowth.

Distribution. Central Oregon to western Montana, south to northern Nevada, southern Idaho, northwestern Utah, and north-central Wyoming.

No subdivisions.

Cele/Rosp

V. COLD DESERT SHRUBLAND. "Semi-Desert" (Costello 1954); "Sagebrush Desert" (Benson 1957); "Great Basin desert" (Shreve 1942, Blaisdell and Holmgren 1984)

14. Desert Alluvial Salt Shrub Branson 1985; "Salt-bush-Greasewood" (Kuchler 1964 [No. 40]); "Shadscale zone" (Billings 1951); "Greasewood (salt-desert shrub)" (Shantz 1938); "Salt-desert shrub" (McArdle and Costello 1938, Blaisdell and Holmgren 1984); "Atriplex confertifolia steppe" (Daubenmire 1978); "Desert shrub" (Garrison et al. 1977 [no. 30], in part)

Series.

Atriplex canescens Atriplex gardneri

Atriplex confertifolia Sarcobatus vermiculatus

Climate and Landform. Usually nearly flat slopes, on landforms derived from the action of water, usually alluvial flats or benches. Summers are hot and dry, winters are cool and dry.

Physiognomy. Medium to low shrubland, with sparse undergrowth of grasses and forbs.

Distribution. Southern Saskatchewan, northern Montana, and southeastern Oregon, to southwestern North Dakota, Wyoming, Colorado, and central Nevada. Must also be present in Utah, Idaho, and New Mexico.

Subdivisions.

A. Saltbush and Shadscale. Costello 1954

|                |                |           |
|----------------|----------------|-----------|
| Atca/Bogr      | Atca/Stcol     | Atga/Elsm |
| Atca-Artr/Elsm | Atco-Artr/Rosp | Bogr/Atca |
| Atca/Elsm-Bogr | Atco/Spai-Bogr |           |

B. Greasewood. Costello 1954

|                 |                 |            |
|-----------------|-----------------|------------|
| Save2-Atco/Eltr | Save2/Leci      | Save2/Rosp |
| Save2-Atrr/Elsm | Save2-Atga/Pose | Save2/Spai |

15. Sagebrush Weaver and Clements 1929, Costello 1954, Garrison et al. 1977, Blaisdell and Holmgren 1984, Branson 1985; (Kuchler 1964 [Nos. 38, 55, and 56]); "Sagebrush-grass" (McArdle and Costello 1938, Billings 1951); "Sagebrush (northern desert shrub)" (Shantz 1938); "Agropyron spicatum steppe" in part (Daubenmire 1978)

Series.

|                      |                      |
|----------------------|----------------------|
| Artemisia arbuscula  | Artemisia tridentata |
| Artemisia cana       | Artemisia tripartita |
| Artemisia longifolia | Purshia tridentata   |
| Artemisia nova       |                      |

Climate and Landform. Cool and moist winters, hot and dry summers. Soils often moderately deep to deep, formed in-place or alluvial, moderately rocky and well-drained to poorly-drained. Flats and slopes, usually on the warm aspect at upper elevations but on the cool aspect at lower elevations.

Physiognomy. Low to medium-height shrubland, usually with fairly dense canopy (becoming more dense with grazing or browsing use), sometimes associated deciduous shrubs, and a lower layer of grasses and forbs. This lower layer can sometimes be dense.

Distribution. Southern Alberta and British Columbia to eastern Washington, northern Idaho, central and eastern Montana, and southwestern North Dakota, to central and eastern Oregon, northern Nevada, southern Idaho, northern Utah, Wyoming, Colorado, southern and western South Dakota, and northern New Mexico. An apparent outlier is in southwestern Utah.

Subdivisions.

A. Great Basin Low Sagebrush.

|            |            |
|------------|------------|
| Arar3/Feid | Arar3/Rosp |
|------------|------------|

B. Basin Big Sagebrush.

|            |                  |             |
|------------|------------------|-------------|
| Arno/Rosp  | Artrt/Bogr       | Artrw/Orhy  |
| Arno/Basa2 | Artrw/Leam       | Artrt/Stcol |
| Artrw/Elsm | Artrt/Leci       | Artrw/Stcol |
| Artrt/Rosp | Artrw-Syor1/Leci | Artrw/Stne  |
| Artrw/Rosp | Artrw/Feid       |             |

C. Mountain and Eastern Foothills Sagebrush.

|                 |                 |                |
|-----------------|-----------------|----------------|
| Arca3/Elsm      | Artrv-Putr/Elda | Artr1/Feid     |
| Arca3-Syoc/Elsm | Artrv/Rosp      | Artr1/Pose     |
| Arca3/Feid      | Artrv/Chna      | Artr1/Stcol    |
| Arca3/Feth      | Artrv/Feid      | Putr/Rosp      |
| Arlo3/Elsm      | Artrv/Feth      | Putr-Atrr/Rosp |
| Arlo3/Rosp      | Artrv/Leki      | Putr-Atrr/Feid |
| Artrv/Elsm      | Artrv/Spcr      | Putr/Mumol     |
| Artrv-Putr/Elsm | Artrv/Stcol     | Putr/Stcol     |

VI. MOUNTAIN AND FOOTHILLS MIXED SHRUBLAND. "Mountain Shrub" (Costello 1954); "Chaparral-mountain shrub" (Garrison et al. 1977 [no. 34], in part)

**16. Deciduous Green Shrubland** "Petran Chaparral" (Weaver and Clements 1929); "Oak-mountain mahogany zone" (Daubenmire 1943)

Series.

|                                 |                                             |
|---------------------------------|---------------------------------------------|
| <i>Amelanchier alnifolia</i>    | <i>Quercus gambelii</i>                     |
| <i>Amelanchier utahensis</i>    | <i>Rhus aromatica</i> ssp. <i>trilobata</i> |
| <i>Cercocarpus montanus</i>     | <i>Symphoricarpos occidentalis</i>          |
| <i>Padus virginiana</i>         | <i>Symphoricarpos oreophilus</i>            |
| <i>Peraphyllum ramosissimum</i> |                                             |

Climate and Landform. Winters cold and wet to moist, summers warm to moderately hot. Slopes and benches, usually weathered in-place. Deep to moderately-deep soils, usually well-drained.

Physiognomy. Tall to medium-tall shrubland, often of several shrub species mixed together, often with a lower shrub layer, and often a lush layer of grasses and forbs.

Distribution. Southwestern and southeastern Montana, and southwestern North Dakota, to southern Idaho, western and northeastern Wyoming, southwestern South Dakota, northern and eastern Utah, southeastern Wyoming, Colorado, northeastern New Mexico, and the northern panhandles of Oklahoma and Texas.

Subdivisions.

**A. Gambel oak.** "Mountain-mahogany-oak Scrub" (Kuchler 1964 [No. 37], in part); "Oak-maple zone" (Billings 1951); "Quercus gambelii chaparral" (Daubenmire 1978)

|                  |                |                |
|------------------|----------------|----------------|
| Pera2-Syor1/Mare | Quga/Cahel     | Quga-Pavi/Feth |
| Quga/Amal        | Quga/Cemo      | Qyga/Syor1     |
| Quga/Amut        | Quga-Pavi/Pamy |                |

**B. Serviceberry and chokecherry**

|                |            |                 |
|----------------|------------|-----------------|
| Amal-Pavi/Viam | AMEL/Rosp  | Pavi-Syoc/Elsm  |
| AMEL/Cagel     | AMEL/Syor1 | Pavi-Syor1/Eltr |

**C. Snowberry**

|           |            |
|-----------|------------|
| Syoc/Elsm | Syor1/Feth |
|-----------|------------|

**D. Mountain-mahogany and skunkbrush**

|                 |            |             |
|-----------------|------------|-------------|
| Cemo-Rhart/Ange | Cemo/Rosp  | Rhart/Mumol |
| Cemo-Rhart/Bocu | Cemo/Stcol | Rhart/Rosp  |
| Cemo/Elda       | Cemo/Stle  | Rhart/Spqr  |
| Cemo/Feid       | Leam/Rice  |             |
| Cemo/Mumol      | Rhart/Cafi |             |

**17. Mountain Riparian Shrub**

Series.

|                                            |                             |
|--------------------------------------------|-----------------------------|
| <i>Acer glabrum</i>                        | <i>Distegia involucreta</i> |
| <i>Alnus incana</i> ssp. <i>tenuifolia</i> | <i>Salix</i> spp.           |
| <i>Betula glandulosa</i>                   | <i>Swida sericea</i>        |

Climate and Landform. Warm to cold, in bottoms and canyons on alluvial soils where water is available throughout the growing season.

Physiognomy. Medium to tall shrub, often with several lower layers of shorter shrubs, tall grasses, sedges, and tall and short forbs. The vertical diversity is very high, especially in the tall-shrub types.

Distribution. Southwestern Montana and southeastern Idaho, through western Wyoming, northern Utah, and western Colorado. Outliers are known from southern Saskatchewan, western and southern South Dakota, and north-central Nebraska; these are probably not true outliers, but the types

that exist in the gaps have not yet been described or identified.

Subdivisions.

A. Foothills and Plains Riparian Shrub

|                 |                 |             |
|-----------------|-----------------|-------------|
| Alint-Befo/SALI | Saca6-SALI/Caaq | Sapel/Thpal |
|-----------------|-----------------|-------------|

B. Montane riparian shrub

|                 |                |           |
|-----------------|----------------|-----------|
| Acgl/Swse       | Saex-SALI/Caca | Sawo/Caut |
| Alint-Sadr/Eqar | Saex-SALI/POA  | Sawo/Dece |
| Alint/Swse      | Sage/Popa      | Sawo/Frvi |
| Diin/Caca       | Sage-SALI/Caca | Swse/Hesp |
| Saam-Saphp/Ashe | Sage-SALI/Caut | Swse/Diin |
| Sabo1-SALI/Caca | Salu/Eqar      | Swse/Riin |
| Sabo1-SALI/Caut | Sawo/Caca      |           |
| Sadr/Caca       | Sawo/Caaq      |           |

C. Subalpine riparian shrub

|                 |                  |             |
|-----------------|------------------|-------------|
| Alint-Beg1/Caaq | Sag11-SALI/CARE  | Saphp/Casc2 |
| Beg1/Casc2      | Sag11-Sabri/Dece | Saphp/Dece  |
| Beg1/Popul      | Saphp/Cale1      |             |
| Sag11/Acro      | Saphp/Caaq       |             |

18. Rocky Slopes, Screes, and Cliffs

Series.

|                        |                                   |
|------------------------|-----------------------------------|
| Ciliaria austromontana | Pentaphylloides floribunda (part) |
| Holodiscus dumosus     | Ribes spp.                        |
| Juniperus communis     | Rubus spp.                        |
| Juniperus horizontalis | Senecio atratus                   |

Climate and Landform. Cool and dry, with steep slopes, rocky outcrops and/or scree slopes evident, and coarse, excessively-drained soils. Vegetation is not dominant, but is subordinate to soil, substrate, and land, which three determine the site character.

Physiognomy. Sparse shrubland or forbland, with rocks and cliffs being more apparent than vegetation.

Distribution. Southwestern North Dakota, central Wyoming, western South Dakota, southeastern Wyoming, and central to western Colorado. Undoubtedly occurs elsewhere.

Subdivisions.

A. Mountain Rocks, Screes, and Cliffs.

|                |            |            |
|----------------|------------|------------|
| Ciau/Cyfr      | Rice/Feid  | Ruid/Hepa2 |
| Hodu/Feth      | Rimo/Aqco  | Seat/Phhe  |
| Hodu/Rice      | Rimo/Popul |            |
| Juco-RIBE/Feth | Ruid/Aqco  |            |

B. Plains, Desert, and Foothills Rocks, Screes, Cliffs.

|           |            |           |
|-----------|------------|-----------|
| Juho/Scsc | Juho/Cahel | Pef1/Ciau |
|-----------|------------|-----------|

VII. MOUNTAIN CONIFEROUS FORESTS (ROCKY MOUNTAIN)

19. Foothills and Plains Coniferous Forests "Submontane zone"  
(Rydberg 1916)

Series.

*Pinus ponderosa* (part)

Climate and Landform. Winters cool and moist, summers warm. Ridges and upper slopes, with skeletal, well-drained soils.

Physiognomy. Open to partly-closed tall canopy of flat-topped trees, sometimes with a sparse shrub layer but more often with a grassy understory of grass species more characteristic of the high plains.

Distribution. Northern Idaho, eastern Montana, and southwestern North Dakota, to southern Idaho, northern and southeastern Wyoming, western South Dakota, western Nebraska, northern Utah, central and western Colorado, and north-central New Mexico.

Subdivisions.

A. Eastern Ponderosa Forest Kuchler 1964 [No. 16]

Pipo/Bocu Pipo-Jusc/Syoc

B. Black Hills Pine Forest Kuchler 1964 [No. 17], part

Pipo/Cahel Pipo/Juco-Syal Pipo/Scsc-Elsm

Pipo/Dain Pipo/Pavi Pipo/Syal

Pipo-Jusc/Cemo Pipo/Quma

20. Montane Coniferous Forest. Rydberg 1916, Benson 1957, Eyre 1963; "Pinus-Pseudotsuga Formation" (Weaver and Clements 1929); "Ponderosa pine-Douglas-fir" (Shantz 1938, Costello 1954); "White fir-Douglasfir-blue spruce zone" (Billings 1951); "Temperate mesophytic forest" [B,D-H] and "Temperate xerophytic forest" [A,C,I] (Daubenmire 1978); "Douglas-fir zone" and "Ponderosa pine zone" (Daubenmire 1943); "Douglas-fir" and "Ponderosa pine" (Garrison et al. 1977 [nos. 20,21])

Series.

Abies concolor Picea pungens (part)

Picea engelmannii(part) Pinus ponderosa (part)

Picea glauca Pseudotsuga menziesii

Climate and Landform. Cool and moist to warm and dry, usually with significant precipitation both as winter snow and growing-season rain, but with coarse, well-drained soils, often thin soils as well. Sites are usually middle to upper slopes and ridges.

Physiognomy. Tall coniferous trees with rounded to pointed crowns. Undergrowth can be highly layered and diverse, with shrubs in one or more layers and herbs in one or more layers; all the way to the other extreme, with only one layer of low grasses or forbs.

Distribution. Eastern Washington, northern Idaho, central and western Montana, and southwestern North Dakota, through eastern Oregon, Idaho, Montana, Wyoming, western South Dakota, Utah, Colorado, northern and eastern Arizona, and northern and southwestern New Mexico.

Subdivisions.

A. Northwestern Ponderosa Forest "Western Ponderosa Forest" (Kuchler 1964 [No. 11], in part)

Pipo/Feid Pipo/Putr Pipo/Spbe

Pipo/Juco Pipo/Rosp Pipo/Syal

Pipo/Phmo Pipo-Jusc/Rosp

B. Douglas-fir Forest Kuchler 1964 [No. 12], in part; "Western Ponderosa Forest" (Kuchler 1964 [No. 11], in part)

Psme/Amal Psme/Juco Psme/Spbe

Psme/Arco2 Psme/Mare Psme/Syal

Psme/Carul Psme/Pamy Psme/Syor1

Psme/Cele Psme/Phma Psme/Vagl

Psme/Feid



C. Colorado and Southwestern Ponderosa Pine "Pine-Douglas-fir Forest" (Kuchler 1964 [No. 18], in part); "Arizona Pine Forest" (Kuchler 1964 [No. 19], in part)

|                |            |                 |
|----------------|------------|-----------------|
| Pipo/Arad      | Pipo/Caro3 | Pipo-Psme/Mumol |
| Pipo/Arno      | Pipo/Cele  | Pipo/Pied-Quga  |
| Pipo/Bogr      | Pipo/Cemo  | Pipo/Quga       |
| Pipo-JUNI/Bogr | Pipo/Fearl | Pipo/Scsc       |
| Pipo/Cagel     | Pipo/Leki  |                 |

D. Colorado and Southwestern Douglas-fir "Pine-Douglas-fir Forest" (Kuchler 1964 [No. 18], in part); "Arizona Pine Forest" (Kuchler 1964 [No. 19], in part); "Spruce-fir-Douglas-fir Forest" (Kuchler 1964 [No. 20], in part)

|                |            |           |
|----------------|------------|-----------|
| Psme/Acgl      | Psme/Cemo  | Psme/Putr |
| Psme/Arad-Juco | Psme/Fearl | Psme/Quga |
| Psme/Cagel     | Psme/Jaam  |           |
| Psme/Caro3     | Psme/Phmo  |           |

E. Southwestern White Fir "Spruce-fir-Douglas-fir" (Kuchler 1964 [No. 20], in part)

Abco Series (whole)

F. Blue Spruce Uplands "Spruce-fir-Douglas-fir" (Kuchler 1964 [No. 20], in part)

|                |                 |                |
|----------------|-----------------|----------------|
| Pipu-Psme/Arad | Pipu-Psme/Fearl | Pipu-Psme/Mare |
| Pipu-Psme/Cafo | Pipu-Psme/Juco  | Pipu/POA       |
| Pipu-Psme/Erex | Pipu-Psme/Libo  |                |

G. Blue Spruce Riparian

|            |                |            |
|------------|----------------|------------|
| Pipu/Alint | Pipu/Amal-Swse | Pipu/Arco2 |
|------------|----------------|------------|

H. Engelmann and White Spruce "Picea glauca province" in part (Daubenmire 1978)

|             |             |            |
|-------------|-------------|------------|
| Pienl/Arco2 | Pienl/moss  | Pigl/Cape4 |
| Pienl/Juco  | Pienl/Phma  | Pigl/Juco  |
| Pienl/Libo  | "Pigl/Cadi" | Pigl/Libo  |

I. Ponderosa Shrub Forest Kuchler 1964 [No. 10]

|            |            |
|------------|------------|
| Pipo/Arpa3 | Psme/Arpa3 |
|------------|------------|

## 21. Montane and Subalpine Pine Forests

### Series.

|                         |                       |
|-------------------------|-----------------------|
| <i>Pinus albicaulis</i> | <i>Pinus contorta</i> |
| <i>Pinus aristata</i>   | <i>Pinus flexilis</i> |

Climate and Landform. Cold to moderately warm, but always dry and well-drained, sometimes excessively well-drained. Usually on upper slopes and ridgetops, often exposed to drying winds. The overall effect is to reduce available moisture to a very low level at most seasons. These trees are all shallow-rooted.

Physiognomy. Mostly open to very open canopies, but sometimes closed canopy, of small to moderately-large trees with rounded to pointed crowns. Growth is slow to very slow, and form is often twisted or gnarled. Undergrowth is usually sparse under closed canopies, and grassy under open canopies.

Distribution. Southern Alberta and Saskatchewan, though northern Idaho, eastern Washington and Oregon, Montana, western North Dakota and South Dakota, to Wyoming, Colorado, western Nebraska, Nevada, Utah, northern Arizona and New Mexico.

Subdivisions.

A. Limber Pine Forest "Douglas-fir Forest" (Kuchler 1964 [No. 12], in part); "Western Spruce-fir Forest" (Kuchler 1964 [no. 15] in part)

Pifl Series (Whole)

B. Bristlecone Pine Forest "Western Spruce-fir Forest" (Kuchler 1964 [No. 15], in part); "Pine-Douglas-fir Forest" (Kuchler 1964 [No. 18], in part)

Piar Series (Whole)

C. Lodgepole Pine Forest "Western Spruce-fir Forest" (Kuchler 1964 [No. 15], in part); "Pine-Douglas-fir Forest" (Kuchler 1964 [No. 18], in part)

Pico Series (Whole)

D. Whitebark Pine Forest "Western Spruce-fir Forest" (Kuchler 1964 [No. 15], in part)

Pial Series (Whole)

22. Subalpine Forest. Rydberg 1916, Benson 1957, Eyre 1963; "Picea-Abies Formation" (Weaver and Clements 1929); "Spruce-fir" (Costello 1954); "Engelmann spruce-[sub]alpine fir zone" (Daubenmire 1943, Billings 1951); "Spruce-fir" (Shantz 1938); "Picea engelmannii province" (Daubenmire 1978); "Fir-spruce" (Garrison et al. 1977 [no. 23])

Series.

Abies lasiocarpa Pinus aristata (part)

Abies lasiocarpa-Picea engelmannii Pinus contorta

Picea engelmannii (part) Pinus flexilis (part)

Pinus albicaulis

Climate and Landform. Cold and moist, with a short to very short growing season. Most of the precipitation comes in the form of winter snow, which is deep and long-lasting. Soils are generally thin and rocky, but can be thin and poorly-drained in marshy pockets. Sites can be on any aspect (all aspects at higher latitudes and elevations) and from upper slopes and benches to middle slopes and small benches, seldom in bottoms.

Physiognomy. Tall coniferous forest with pointed crowns, often with more than one tree species codominating, sometimes with a medium and/or low shrub layer, usually with sparse undergrowth in general.

Distribution. From the arctic treeline southward through the Rocky Mountains to southern New Mexico and Arizona. Not in the Black Hills.

Subdivisions.

A. Western Spruce-Fir Forest Kuchler 1964 [No. 15], part

Abla/Cagel Abla-Pien1/Libo Abla-Pien1/Vace

Abla/Mare Abla-Pien1/Mare Abla-Pien1/Vagl

Abla/Thfel Abla-Pien1/Meci Abla-Pien1/Vasc

Abla-Pien1/Acgl Abla-Pien1/moss Pien1/Calel

Abla-Pien1/Acru Abla-Pien1/Pamy Pien1/Cadi

Abla-Pien1/Arco2 Abla-Pien1/Phma Pipu-Pien1/Eqar

Abla-Pien1/Arla Abla-Pien1/Pone2 Pien1-Pipu/Gatr2

Abla-Pien1/Caca Abla-Pien1/RIBE Pien1/Trda

Abla-Pien1/Caru1 Abla-Pien1/Sagl1 Pien1/Vace

Abla-Pien1/Cagel Abla-Pien1/Setr Pien1/Vasc

Abla-Pien1/Caro3 Abla-Pien1/Spbe

Abla-Pien1/Juco Abla-Pien1/Thoc

B. Southwestern Spruce-Fir Forest Kuchler 1964 [No. 21]

|                 |                 |                 |
|-----------------|-----------------|-----------------|
| Abla-Pienl/Erex | Abla-Pienl/Vamy | Pienl-Psme/Juco |
| Abla-Pienl/Rupa | Pienl/Feth      | Pienl/Vamy      |

VIII. MOUNTAIN DECIDUOUS FORESTS

23. Aspen

Series.

Populus tremuloides

Climate and Landform. Cool to cold and moist, with moderately short growing season. Considerable precipitation comes as winter snow, but significant summer rain as well. Soils are deep, and usually not rocky, but at best only moderately well-drained. Benches and moist upper slopes; usually not on ridgetops, but sometimes found on large protected plateaus.

Physiognomy. Moderately-tall to tall deciduous forests, with well-developed shrub layers and very well-developed tall grasses, short grasses, and tall and short forbs.

Distribution. Southern Alberta and Saskatchewan, southwestern North Dakota, and the northern Black Hills; also in the Rocky Mountains from western and southeastern Wyoming, and northern Utah, through Colorado to northern New Mexico.

Subdivisions.

A. Rocky Mountain Aspen

|             |             |             |
|-------------|-------------|-------------|
| Potrl/Amal  | Potrl/Fearl | Potrl/Luar  |
| Potrl/Arad  | Potrl/Feth  | Potrl/Ptaq  |
| Potrl/Artr  | Potrl/Hesp  | Potrl/Sara  |
| Potrl/Carul | Potrl/Juco  | Potrl/Syorl |
| Potrl/Cagel | Potrl/Lale  | Potrl/Thfel |
| Potrl/Ceve  | Potrl/LIGU  | Potrl/Vete  |

B. Canadian, Plains, and Black Hills Aspen

|             |            |            |
|-------------|------------|------------|
| Potrl/Cocol | Potrl/Mare | Potrl/Pavi |
|-------------|------------|------------|

24. Mountain Deciduous Riparian Forest

Series.

Populus angustifolia

Climate and Landform. Steep, lower mountain canyons and bottoms, usually with rocky, well-drained soils. Occupies a middle position between plains cottonwood below and willow-birch-alder shrublands below; both the neighbors are on less well-drained soils. Warm summers and cold winters. Water is always available, since these communities always occur near the banks of free-flowing streams.

Physiognomy. Medium-height to tall forest of deciduous trees with rounded crowns; understory is mostly dominated by tall to medium-height shrubs, with good growth of tall, matted grasses beneath.

Distribution. North-central and western Wyoming and southeastern Idaho, through Utah, southeastern Wyoming, north-central Colorado, and western Colorado, to southwestern Colorado. Possibly also in western Montana, northwestern New Mexico, and northeastern Arizona.

No Subdivisions.

Populus angustifolia series (Whole)

IX. ALPINE GRASSLANDS AND FORBLANDS "Alpine Meadows and Barren" (Kuchler 1964 [No. 52]); "Arctic-alpine zone" (Rydberg 1916); "Tundra region, Rocky Mountain section (Daubenmire 1978); "Alpine tundra zone" (Daubenmire 1943); "Alpine" (Garrison et al. 1977 [no. 44])

25. Alpine Grasslands "Carex-Poa Formation" (Weaver and Clements 1929)

Series.

|                        |                              |
|------------------------|------------------------------|
| Carex aquatilis (part) | Carex pyrenaica              |
| Carex capillaris       | Carex scopulorum             |
| Carex engelmannii      | Deschampsia cespitosa (part) |
| Carex elynoides        | Kobresia myosuroides         |
| Carex haydeniana       | Kobresia sibirica            |
| Carex microglochin     |                              |
| Carex nigricans        |                              |

Climate and Landform. Very cold and moist, with significant snow-fall. Water is usually present, but is frozen most of the year. Sites are protected, in bottoms or swales, and have moderately-deep soil. Soil formation takes a very long time. Physiognomy. Short to medium-height "grass" (actually mostly sedges), with a variety of low forbs. Although many "grasses" grow in bunches, the tufts are not usually conspicuous.

No subdivisions.

|            |             |                |
|------------|-------------|----------------|
| Caaq/Pegr1 | Cami3/Bivi  | Casc2/moss     |
| Caca3/Bivi | Cani/JUNC   | Dece/Acro      |
| Cael/Acro  | Capy/Erme   | Dece/Judr      |
| Cael/OREO  | Capy/moss   | Komy/Acro-Caru |
| Cael/Sede  | Casc2/Acro  | Komy/Trda      |
| Cael/Trda  | Casc2/Bivi  | Komy/Trna      |
| Caen/Saren | Casc2/Calel |                |
| Caha/Poar2 | Casc2/Dece  |                |

26. Alpine Uplands, Windscars, and Early Snowmelt Areas

Series.

|                     |                               |
|---------------------|-------------------------------|
| Acomastylis rossii  | Oreoxis bakeri                |
| Artemisia arctica   | Paronychia pulvinata          |
| Carex arapahoensis  | Physaria alpina               |
| Carex foenea        | Phlox sibirica                |
| Carex nardina       | Polemonium viscosum           |
| Carex perglobosa    | Salix arctica                 |
| Carex rupestris     | Salix reticulata ssp. nivalis |
| Cirsium scopulorum  | Saxifraga serpyllifolia       |
| Claytonia megarhiza | Smelowskia calycina           |
| Dryas octopetala    | Trifolium dasyphyllum         |
| Heuchera breviflora | Trifolium nanum               |
| Ivesia gordonii     | Trifolium parryi              |
| Juncus drummondii   | Valeriana capitata            |

Subdivisions.

A. Mats

|           |            |           |
|-----------|------------|-----------|
| Droc/Caru | Droc/Saren | Papu/Libi |
|-----------|------------|-----------|

B. Fellfields and Ridges

|            |                  |            |
|------------|------------------|------------|
| Caar3/Libi | Caru/Trda        | Smca/Arbo  |
| Canal/Beal | Hebr-Hepa2/Erpi2 | Trda/Caru  |
| Capel/Siac | Ivgo/Erfe        | Trda/Libi  |
| Caru/Komy  | Judr/Sipr        | Trna/Erpi2 |
| Caru/Libi  | Orba/Saar-Sede   | Trna/Libi  |
| Caru/Phsi  | Sase/Febr        | Trpa/Arpo  |

C. Ridges and Protected Sites with Coarse Soils

|            |            |           |
|------------|------------|-----------|
| Acro/Bibi2 | Acro/Trna  | Saar/Erme |
| Acro/Caru  | Saren/Acro | Saar/Trpa |
| Acro/Poar2 | Saren/Vace | Trpa/Dece |
| Acro/Trda  | Saar/Acro  |           |

27. Bog-Marsh Forblands and Late Snowmelt Areas

Series.

|                      |                         |
|----------------------|-------------------------|
| Antennaria media     | Senecio triangularia    |
| Caltha leptosepala   | Sibbaldia procumbens    |
| Cardamine cordifolia | Trifolium parryi (part) |
| Primula parryi       | Trollius albiflorus     |
| Saxifraga odontoloma |                         |

No subdivisions.

|             |                |                 |
|-------------|----------------|-----------------|
| Anme/Poar2  | Saod/Dece      | Sipr/Capy       |
| Cale1/Clrh  | Setr/Lifi      | Trpa/Raad       |
| Caco2/Cale1 | Sipr/Libi-moss | Tral-Lifi/Erpel |
| Prpa2/Dece  | Sipr/Caeb      |                 |

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REJECTED KUCHLER TYPES  
(BASED ON 1964 CLASSIFICATION)

|                                        |                    |
|----------------------------------------|--------------------|
| 11. Western Ponderosa Forest           | Divided, realigned |
| 12. Douglas-fir Forest                 | Divided, realigned |
| 15. Western Spruce-fir Forest          | Divided, realigned |
| 18. Pine-Douglas-fir Forest            | Divided, realigned |
| 19. Arizona Pine Forest                | Divided, realigned |
| 20. Spruce-fir-Douglas-fir Forest      | Divided            |
| 37. Mountain-mahogany-oak Scrub        | Divided            |
| 38. Great Basin Sagebrush              | Divided, realigned |
| 40. Saltbush-Greasewood                | Divided            |
| 50. Fescue-Wheatgrass                  | Divided            |
| 52. Alpine Meadows and Barren          | Divided            |
| 55. Sagebrush Steppe                   | Divided, realigned |
| 56. Wheatgrass-needlegrass Shrubsteppe | Divided, realigned |
| 68. Wheatgrass-grama-buffalograss      | Small part of 03A  |
| 98. Northern Floodplain Forest         | Divided            |

BIBLIOGRAPHY

AIKMAN, J. M. 1935. Native vegetation of the region. In Possibilities of shelterbelt planting in the plains region. U. S. Forest Service, Plains Shelterbelt Project, pp. 155-174.

BENSON, L. 1957. Plant Classification. Heath, Boston, 688 pp.

BILLINGS, W. D. 1951. Vegetation zonation in the Great Basin of western North America. Intern. Union Biol. Sci. Ser. B 9:101-122.

BLAISDELL, J. P., and R. C. HOLMGREN. 1984. Managing intermountain rangelands -- Salt-desert shrub ranges. USDA Forest Service Genl. Tech. Rept. INT-163, 52 pp.

BRANSON, F. A. 1985. Vegetation changes on western rangelands. Soc. Range Manage., Denver CO, Range Monogr. 2, 76 pp.

CLEMENTS, F. E. 1920. Plant Indicators. Carnegie Inst. Washington Publ.

COUPLAND, R. T. 1979. Distribution of grasses and grasslands of North America. In NUMATA, M., ed. (1979). Ecology of grasslands and bambuolands in the world. Junk, The Hange, pp. 77-83.



- DAUBENMIRE, R. F. 1943. Vegetational zonation in the Rocky Mountains. *Bot. Rev.* 9(6):325-393.
- DAUBMENIRE, R. 1978. Plant geography, with special reference to North America. Academic Press, New York, 338 pp.
- DODD, J. D. 1968. Grassland associations in North America. *In* GOULD, F. W. *Grass Systematics*. McGraw-Hill, New York, pp. 322-338.
- EYRE, S. R. 1963. *Vegetation and Soils: A World Picture*. Aldine, Chicago, 324 pp.
- GARRISON, G. A., A. J. BJUGSTAD, D. A. DUNCAN, M. E. LEWIS, and D. R. SMITH. 1977. Vegetation and environmental factors of forest and range ecosystems. *USDA Forest Service Agric. Handb.* 475, 68 pp. + 1 map, 1:7,500,000.
- GATES, F. C. 1940. *Flora of Kansas*. Kansas State College Agric. Expt. Sta., Topeka, 266 pp.
- KAUL, R. B. 1986. Physical and floristic characteristics of the Great Plains. *In* MCGREGOR, R. L., et al. *Flora of the Great Plains*. Univ. Press Kansas, pp. 7-10.
- KUCHLER, A. W. 1954. *Manual to Accompany the Map: Potential Natural Vegetation of the Coterminous United States*. Amer. Geogr. Soc. Special Publ. 36, 39 + 116 pp.
- McARDLE, R. E., and D. F. COSTELLO. 1938. The virgin range. *In* The western range. *Congressional Documents*, 74th Congress, 2nd Session, Doc. 199, pp. 71-80.
- RISSE, P. G., E. C. BIRNEY, H. D. BLOCKER, S. W. MAY, W. J. PARTON, and J. A. WIENS. 1981. *The True Prairie Ecosystem*. Hutchinson Ross, Stroudsburg PA, 557 pp.
- RYDBERG, P. A. 1916. Vegetative life zones of the Rocky Mountain Region. *Mem. New York Bot. Gard.* 6:477-499.
- SHANTZ, H. L. 1938. Plants as soil indicators. *In* *Soils and men: Yearbook of agriculture 1938*. U. S. Dept. Agriculture, Washington DC, pp. 835-860.
- SHREVE, F. 1942. The desert vegetation of North America. *Bot. Rev.* 8(4):195-246.
- SINGH, J. S., W. K. LAURENROTH, R. K. HEITSCHMIDT, and J. L. DODD. 1983. Structural and functional attributes of the vegetation of northern mixed prairie of North America. *Bot. Rev.* 49(1):117-149.
- WEAVER, J. E., and F. E. CLEMENTS. 1929. *Plant Ecology*. McGraw-Hill, New York, 520 pp.

#### APPENDIX 6. BIBLIOGRAPHY

- ALBERTSON, F. W. 1953. Report of study of grassland areas of Badlands National Monument, South Dakota; Fort Robinson Military Reservation in Nebraska; North and South Units of Theodore Roosevelt National Memorial Park, North Dakota; and Wind Cave National Park, South Dakota. Final Report on Contract, USDI National Park Service, 23 pp. + tables + photos.
- ALBERTSON, F. W., and J. E. WEAVER. 1942. History of the native vegetation of western Kansas during seven years of continuous drought. *Ecol. Monogr.* 12(1):23-51.
- ALBERTSON, F. W., and J. E. WEAVER. 1944. Effects of drought, dust, and intensity of grazing on cover and yield of short-grass pastures. *Ecol. Monogr.* 14(1):1-29.
- ALDOUS, A. E. and H. C. SHANTZ. 1924. Types of vegetation in the semiarid portion of the United States and their economic significance. *J. Agric. Research* 28(2):99-127.
- ALEXANDER, B. G., Jr. 1981. A preliminary forest habitat classification for the Lincoln National Forest, New Mexico. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Flagstaff, Arizona, final report of contract 53-82-FT-9-104, 85 pp.
- ALEXANDER, B., F. RONCO Jr., E. L. FITZHUGH, and J. A. LUDWIG. 1984. A classification of forest habitat types of the Lincoln National Forest, New Mexico. USDA Forest Service Genl. Tech. Rept. RM-104, 29 pp.
- ALEXANDER, B. G., F. RONCO Jr., A. S. WHITE, and J. A. LUDWIG. 1984. Douglas-fir habitat types of northern Arizona. USDA Forest Service Genl. Tech. Report RM-108, 13 pp.
- ALEXANDER, R. R., G. R. HOFFMAN, and J. M. WIRSING. 1986. Forest vegetation of the Medicine Bow National Forest in southeastern Wyoming: A habitat type classification. USDA Forest Service Res. Paper RM-271, 39 pp.
- ANTOS, J. A., B. McCUNE, and C. BACA. 1983. The effect of fire on an ungrazed western Montana grassland. *Amer. Midl. Nat.* 110(2):354-364.
- ARMOUR, C. D., S. C. BUNTING, and L. F. NEUENSCHWANDER. 1984. Fire intensity effects on the understory in ponderosa pine forests. *J. Range Manage.* 37(1):44-49.
- ARNO, S. F., D. G. SIMMERMAN, and R. E. KEANE. 1985. Forest succession on four habitat types in western Montana. USDA Forest Service.
- ARNOLD, J. F. 1950. Changes in ponderosa pine bunchgrass ranges in northern Arizona resulting from pine regeneration and grazing. *J. Forestry* 48(2):118-126.
- AUSTIN, D. D., P. J. URNESS, and J. KING. 1984. Late summer changes in mule deer diets with increasing use on bitterbrush rangeland. *Great Basin Nat.* 44(4):572-574.
- BAKER, W. L. 1982. Alpine vegetation of the Sangre de Cristo Mountains, New Mexico: gradient analysis, classification, and biogeography. *Arctic and Alpine Research* 15(2):223-240.
- BAKER, W. L. 1983. Some aspects of the presettlement vegetation of the Piceance Basin, Colorado. *Great Basin Nat.* 43(2):687-699.
- BAKER, W. L. 1982. Natural vegetation of the Piceance Basin. In *Colorado Natural Heritage Inventory: Inventory of the Piceance Basin, Colorado*. Report from The Nature Conservancy to USDI Bureau of Land Management, Craig District. Volume 4, Appendix D, 113 pp.
- BAMBERG, S. A., and J. MAJOR. 1968. Ecology of the vegetation and soils associated with calcareous parent materials in three alpine regions of Montana. *Ecol. Monogr.* 38(2):127-167.
- BARNES, P. W., and A. T. HARRISON. 1982. Species distribution and community organization in a Nebraska sandhills mixed prairie as influenced by plant/soil-water relationships. *Oecologia* 52:192-201.
- BARNES, P. W., A. T. HARRISON, and S. P. HEINISCH. 1984. Vegetation patterns in relation to topography and edaphic variation in Nebraska sandhills prairie. *Prairie Nat.* 16(4):145-158.

- BARTOS, D. L., and J. E. LESTER. 1984. Effects of 2,4-D on a *Populus tremuloides* community in the western United States -- 22 years after treatment. *Great Basin Nat.* 44(3):459-467.
- BEEBE, J. D., and G. R. HOFFMAN. 1968. Effects of grazing on vegetation and soils in southeastern South Dakota. *Amer. Midl. Nat.* 80(1): 96-110.
- BEETLE, A. A. 1952. A relic [sic] area on the Wyoming shortgrass plains. *J. Range Manage.* 5:141-143.
- BEETLE, A. A. 1952. Range survey of the Bighorn National Forest (1951). *Wyoming Agric. Expt. Sta. Circ.* 9, 18 pp.
- BEETLE, A. A. 1961. Range survey in Teton County, Wyoming. I. Ecology of range resources. *Univ. Wyoming Agric. Expt. Sta. Bull.* 376, 42 pp.
- BEETLE, A. A. 1974. Vegetation of the John D. Rockefeller, Jr., Memorial Parkway. *Wyoming Agric. Expt. Sta., Univ. Wyoming Coop. Research Rept.*, part 1, pp. 1-10.
- BEETLE, A. A., and C. B. MARLOWE. 1974. A vegetative survey of Fossil Butte National Monument, Kemmerer, Wyoming. *Wyoming Agric. Expt. Sta., Univ. Wyoming Coop. Research Rept.*, part 2, pp. 11-40.
- BIERLY, K. F. 1982. Meadow and fen vegetation in Big Meadows, Rocky Mountain National Park. M. S. Thesis, Colorado State Univ., Fort Collins, 102 pp.
- BJUGSTAD, A. J. 1965. Vegetation measurements in relation to range condition classification on the principal range sites of southwestern North Dakota. Ph. D. Thesis, North Dakota State Univ., Fargo, 201+61 pp.
- BLACK HILLS NATIONAL FOREST. 1982. Coordination guidelines for timber management in Black Hills deer habitat. 31 pp.
- BLACK HILLS NATIONAL FOREST. 1985. Index of vegetative (sic) descriptions. In: *Best Minerals Management Practices, Section C*, pp. 1-61. Black Hills National Forest, Custer, South Dakota.
- BOCK, C. E., and J. H. BOCK. 1983. Responses of birds and deer mice to prescribed burning in ponderosa pine. *J. Wildlife Manage.* 47(3):836-840.
- BOCK, C. E., J. H. BOCK, W. R. KENNEY, and V. M. HAWTHORNE. 1984. Responses of birds, rodents, and vegetation to livestock enclosure in a semidesert grassland site. *J. Range Manage.* 47(3):239-242.
- BOLLEN, E. G. 1964. Plant ecology of spring-fed marshes in western Utah. *Ecol. Monogr.* 34(2):143-166.
- BONHAM, C. D., and J. S. HANNAN. 1978. Blue grama and buffalograss patterns in and near a prairie dog town. *J. Range Management* 31(1):63-65.
- BONHAM, C. D., and A. LERWICK. 1976. Vegetation changes induced by prairie dogs on shortgrass range. *J. Range Management* 29(3):221-225.
- BOOTH, W. E. 1941. Revegetation of abandoned fields in Kansas and Oklahoma. *Amer. J. Bot.* 28:415-422.
- BOUTTON, T. W., A. T. HARRISON, and B. N. SMITH. 1980. Distribution of biomass of species differing in photosynthetic pathway along an altitudinal transect in southeastern Wyoming grassland. *Oecologia* 45:287-298.
- BOWNS, J. E., and C. F. BAGLEY. 1986. Vegetation responses to long-term sheep grazing on mountain ranges. *J. Range Manage.* 39(5):431-434.
- BOYCE, D. A. 1977. Vegetation of the south fork of the White River valley, Colorado. Ph. D. Thesis, Univ. of Colorado, Boulder, 328 pp.
- BRAGG, T. B. 1978. Effects of burning, cattle grazing, and topography on vegetation of the choppy sands range site in the Nebraska sandhills prairie. In Hyder, D. N., ed., *Proc. First Intl. Rangeland Cong., Soc. Range Manage.*, Denver, Colorado, pp. 248-253.
- BRAND, M. D. 1980. Secondary succession in the mixed grass prairie of southwestern North Dakota. Ph. D. Dissert., North Dakota State Univ., Fargo, 77 pp.
- BRAND, M. D., and H. GOETZ. 1978. Secondary succession on a mixed grass community in southwestern North Dakota. *Proc. North Dakota Acad. Sci.* 32(2):67-78.

BRANSON, F. A., R. F. MILLER, and I. S. McQUEEN. 1965. Plant communities and soil moisture relationships near Denver, Colorado. *Ecology* 46:311-319.

BRANSON, F. A., R. F. MILLER, and I. S. McQUEEN. 1970. Plant communities and associated soil and water factors on shale-derived soils in northeastern Colorado.

BRAWN, J. D., and R. P. BALDA. 1983. Use of nest boxes in ponderosa pine forests. In Davis, J. W., et al., eds. *Snag Habitat Management*. USDA Forest Service Genl. Tech. Rept. RM-99, pp. 159-164.

BRIGGS, G. M., and J. A. MACMAHON. 1983. Alpine and subalpine wetland plant communities of the Uinta Mountains. *Great Basin Nat.* 43(4):523-530.

BRINEGAR, T. E., and F. D. KEIM. 1942. The relations of vegetative composition and cattle grazing on Nebraska range land. *Univ. Nebraska Expt. Sta. Res. Bull.* 123, 39 pp.

BROTHERSON, J. D., S. R. RUSHFORTH, and J. R. JOHANSEN. 1983. Effects of long-term grazing on cryptogam crust cover in Navajo National Monument, Arizona. *J. Range Manage.* 36(5):579-581.

BROWN, R. W. 1971. Distribution of plant communities in southeastern Montana badlands. *Amer. Midl. Nat.* 85(2):458-477.

BRUNER, W. E. 1931. The vegetation of Oklahoma. *Ecol. Monogr.* 1(2):99-188.

BUCKHOUSE, J. C., and J. L. MATTISON. 1980. Potential soil erosion of selected habitat types in the high desert region of central Oregon. *J. Range Manage.* 36(5):579-581.

BUE, I. G., L. BLANKENSHIP, and W. H. MARSHALL. 1952. The relationship of grazing practices to waterfowl breeding populations and production on stock ponds in western South Dakota. *Proc. 17th North Amer. Wildl. Conf.*, pp. 396-414.

BUNIN, J. E. 1975. The vegetation of the west slope of the Park Range, Colorado. Ph. D. Thesis, Univ. of Colorado, Boulder.

BUNIN, J. E. 1985. Vegetation of the City of Boulder, Colorado, open space lands. Report to City of Boulder, Colorado, 112 pp. + maps.

BURZLAFF, D. F. 1960. Soil as a factor influencing distribution of vegetation in the sandhills of Nebraska. Ph. D. Dissertation, Utah State Univ., Logan, 156 pp.

BUTLER, J., H. GOETZ, and J. L. RICHARDSON. 1986. Vegetation and soil-landscape relationships in the North Dakota badlands. *Amer. Midl. Nat.* 116(2):378-386.

CANNON, R. W., and F. L. KNOPF. 1984. Species composition of a willow community relative to seasonal grazing histories in Colorado. *Southwest. Nat.* 29(2):234-237.

CHOLEWA, A. F., and F. D. JOHNSON. 1983. Secondary succession in the *Pseudotsuga menziesii*/Physocarpus malvaceus association. *Northw. Sci.* 57(4):273-282.

CHRISTENSEN, E. M., and H. B. JOHNSON. 1964. Presettlement vegetation and vegetational change in three valleys in central Utah. *Brigham Young Univ. Sci. Bull. Biol. Ser.* 4(4):4-16.

CHRISTENSEN, E. M., and S. L. WELSH. 1963. Presettlement vegetation of the valleys of western Summit and Wasatch Counties, Utah. *Proc. Utah Acad. Sci. Arts Letters* 40(2):163-174.

CLARKE, S. E., J. A. CAMPBELL, and J. B. CAMPBELL. 1942. An ecological and grazing capacity study of the native grass pastures in southern Alberta, Saskatchewan, and Manitoba. *Canadian Min. Agric. Tech. Bull.* 44 (Publ. 738), 31 pp.

CLARKE, S. E., E. W. TISDALE, and N. A. SKOGLUND. 1943. The effects of climate and grazing practices on short-grass prairie vegetation in southern Alberta and southwestern Saskatchewan. *Canadian Min. Agric. Tech. Bull.* 46 (Publ. 747), 53 pp.



- COLE, D. N. 1982. Vegetation of two drainages in Eagle Cap Wilderness, Wallowa Mountains, Oregon. USDA Forest Service Res. Paper INT-288, 42 pp.
- COLE, D. N. 1985. Recreational trampling effects on six habitat types in western Montana. USDA Forest Service Res. Paper INT-350, 43 pp.
- COLLINS, A. R., J. P. WORKMAN, and D. W. URESK. 1984. An economic analysis of black-tailed prairie dog (*Cynomys ludovicianus*) control. *J. Range Manage.* 37(4):358-361.
- COLLINS, E. I. 1984. A bibliography of Wyoming plant community descriptions. *Prairie Nat.* 16(1):25-38.
- COOK, C. W., and T. W. BOX. 1961. A comparison of the loop and point methods of analyzing vegetation. *J. Range Manage.* 14:22-27.
- COOPER, H. W. 1953. Amounts of big sagebrush in plant communities near Tensleep, Wyoming, as affected by grazing treatment. *Ecology* 34(1):186-189.
- COOPER, S. V. 1975. Forest habitat types of northwestern Wyoming and contiguous portions of Montana and Idaho. Ph. D. Dissertation, Washington State Univ., 190 pp.
- COOPER, S. V., K. NEIMAN, and R. STEELE. 1983. Forest habitat types of northern Idaho. USDA Forest Service, Missoula, Montana, review draft, 210 pp.
- COPELAND, W. N., and S. E. GREENE. 1982. Stinking Lake Research Natural Area. In FRANKLIN, J. F., et al., Federal Research Natural Areas in Oregon and Washington. Suppl. 12, pp. SL1-12. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.
- COSTELLO, D. F. 1944. Natural revegetation of abandoned plowed land in the mixed prairie association of northeastern Colorado. *Ecology* 25(3):312-326.
- COSTELLO, D. F. 1944. Important species of the major forage types in Colorado and Wyoming. *Ecol. Monogr.* 14:107-134.
- COSTELLO, D. F., and G. T. TURNER. 1944. Judging condition and utilization of short-grass ranges on the central Great Plains. *USDA Farmers' Bull. No.* 1949, 21 pp.
- COUPLAND, R. T. 1950. Ecology of mixed prairie in Canada. *Ecol. Monogr.* 20(4):271-315.
- CRANE, M. F., and J. R. HABECK. 1982. Vegetative responses after a severe wildfire on a Douglas-fir/ninebark habitat type. In BAUMGARTNER, D. M., ed., Site Preparation and Fuels Management on Steep Terrain. Washington State Univ., Pullman, pp. 133-138.
- CRANE, M. F., J. R. HABECK, and W. C. FISCHER. 1983. Early postfire revegetation in a western Montana Douglas-fir forest. USDA Forest Service Res. Paper INT-319, 29 pp.
- CROUCH, G. L. 1981. Regeneration on aspen clearcuts in northwestern Colorado. USDA Forest Service Research Note RM-407, 5 pp.
- CROUCH, G. L. 1985. Effects of clearcutting a subalpine forest in central Colorado on wildlife habitat. USDA Forest Service Research Paper RM-258, 12 pp.
- CROWTHER, E. G., and K. T. HARPER. 1965. Vegetational and edaphic characteristics associated with aspen "strips" in Big Cottonwood Canyon. *Proc. Utah Acad. Sci.* 42(3):222-230.
- CUNNINGHAM, H. 1971. Soil-vegetation relationships of a bitterbrush-sagebrush association in northwestern Colorado. M. S. Thesis, Colorado State University, Fort Collins.
- CURRENT, F. B. 1984. The distribution and description of the vegetation of Battle Mountain as explained by abiotic factors. Ph. D. Dissert., Univ. Wyoming, Laramie, 340 pp.
- DAHL, B. E. 1963. Soil moisture as a predictive index to forage yield for the sandhills range type. *J. Range Manage.* 16:128-132.



- DARLAND, R. W., and J. E. WEAVER. 1945. Yields and consumption of forage in three pasture types: An ecological analysis. Univ. Nebraska, Nebraska Conserv. Bull. 27, 76 pp.
- DAUBENMIRE, R. 1952. Forest vegetation of northern Idaho and adjacent Washington, and its bearing on concepts of vegetation classification. Ecol. Monogr. 22:301-330.
- DAUBENMIRE, R. 1968. Plant Communities. Harper and Row, New York, 300 pp.
- DAUBENMIRE, R. 1970. Steppe vegetation of Washington. Washington Agric. Expt. Sta. Tech. Bull. 62, 112 pp.
- DAUBENMIRE, R. 1978. Plant Geography, with Special Reference to North America. Academic, New York, 338 pp.
- DAUBENMIRE, R., and J. B. DAUBENMIRE. 1968. Vegetation of eastern Washington and northern Idaho. Washington Agric. Expt. Sta. Tech. Bull. 60, 104 pp.
- DEALY, J. E. 1971. Habitat characteristics of the Silver Lake mule deer range. USDA Forest Service Research Paper PNW-125, 99 pp.
- DEALY, J. E., D. A. LECKENBY, and D. M. CONCANNON. 1981. Wildlife habitats in managed rangelands -- the great basin of southeastern Oregon: plant communities and their importance to wildlife. USDA Forest Service Genl. Tech. Rept. PNW-120, 66 pp.
- DESPAIN, D. G. 1981. The vegetation of the Bighorn Mountains of Wyoming in relation to substrate and climate. Ph. D. Thesis, Univ. Alberta, Edmonton, 136 pp.
- DESPAIN, D. G. 1973. Vegetation of the Bighorn Mountains of Wyoming in relation to substrate and climate. Ecol. Monogr. 43(3):329-355.
- DeVELICE, R. L., and J. A. LUDWIG. 1983. Forest habitat types south of the Mogollon Rim, Arizona and New Mexico. Final Report, coop. agreement, Rocky Mountain Forest and Range Experiment Sta. and New Mexico State Univ., 210 pp.
- DeVELICE, R. L., J. A. LUDWIG, W. H. MOIR, and F. RONCO Jr. 1985. Forests of northern New Mexico and southern Colorado: Plot data. USDA Forest Service, Rocky Mountain Region, Lakewood, Colorado, 323 pp.
- DeVELICE, R. L., J. A. LUDWIG, W. H. MOIR, and F. RONCO Jr. 1986. A classification of forest habitat types of northern New Mexico and southern Colorado. USDA Forest Service Genl. Tech. Rept. RM-131, 59 pp.
- DIX, R. A., and J. D. RICHARDS. 1976. Possible changes in species structure of the subalpine forest induced by increased snowpack. In Steinhoff and Ives (1976), pp. 311-322.
- DIX, R. L. 1960. The effects of burning on the mulch structure and species composition of grasslands in western North Dakota. Ecology 41(1):49-56.
- DIX, R. L., and F. E. SMEINS. 1967. The prairie, meadow, and marsh vegetation of Nelson County, North Dakota. Canadian J. Bot. 45:21-58.
- DIXON, H. 1935. Ecological studies on the high plateaus of Utah. Bot. Gaz. 97(2):272-320.
- DODD, J. D., and R. T. COUPLAND. 1966. Vegetation of saline areas in Saskatchewan. Ecology 47(6):958-968.
- DOESCHER, P. S., R. F. MILLER, and A. H. WINWARD. 1984. Soil chemical patterns under eastern Oregon plant communities dominated by big sagebrush. Soil Sci. Soc. Amer. J. 48:659-663.
- DYRNESS, C. T., and C. T. YOUNGBERG. 1966. Soil-vegetation relationships within the ponderosa pine type in the central Oregon pumice region. Ecology 47(1):122-138.
- ERDMAN, J. A. 1970. Pinyon-juniper succession after natural fires on residual soils of Mesa Verde, Colorado. Brigham Young Univ. Sci. Bull. Biol. Ser. 11(2):1-26.
- ERDMAN, J. A., C. L. DOUGLAS, and J. W. MARR. 1969. Wetherill Mesa studies: environment of Mesa Verde, Colorado. USDI National Park Service Archaeol. Research Series No. 7B, 72 pp.

- FERCHAU, H. 1973. Description of vegetation. In: Environmental setting of the Parachute Creek valley: an ecological inventory. Thorne Ecol. Inst. and Atlantic Richfield Co., pp. 36-55.
- FISSER, H. G. 1964. Range survey in Wyoming's Big Horn Basin. Univ. of Wyoming Agric. Expt. Sta. Bull. 424, 44 pp.
- FISSER, H. G., D. C. TRUEBLOOD, and D. D. SAMUELSON. 1979. Soil-vegetation relationships on rangeland exclosures in the Grass Creek planning unit of north central Wyoming. Wyoming Agric. Expt. Sta., Laramie, Sci. Rept. 969, 278 pp.
- FISSER, H. G., M. K. OWENS, J. W. UHLRICH, W. J. WAUGH, D. R. RODGERS, and N. E. HARGIS. 1980. Phenology and production studies on semi-arid shrub types, annual progress report -- 1979 results. Wyoming Agric. Expt. Sta., Laramie, Sci. Rept. 1106, 216 pp.
- FITZHUGH, E. L., W. H. MOIR, J. A. LUDWIG, and F. RONCO Jr. 1983. Forest habitat types in the Apache, Gila, and part of the Cibola National Forests. USDA Forest Service Research Paper, in press.
- FORCELLA, F. 1978. Flora and chorology of the *Pinus albicaulis*-*Vaccinium scoparium* association. Madrono 25:139-150.
- FORSLING, C. L. 1931. A study of the influence of herbaceous plant cover on surface run-off and soil erosion in relation to grazing on the Wasatch Plateau in Utah. USDA Tech. Bull. 220, 71 pp.
- FORWOOD, J. R., and C. E. OWENSBY. 1985. Nutritive value of tree leaves in the Kansas Flint Hills. J. Range Manage. 38(1):61-64.
- FRANCIS, R. E. 1986. Phyto-edaphic communities of the upper Rio Puerco watershed, New Mexico. USDA Forest Service Res. Paper RM-272, 73 pp.
- FROLIK, A. L., and W. O. SHEPHERD. 1940. Vegetative composition and grazing capacity of a typical area of Nebraska sandhills range land. Univ. Nebraska Agric. Expt. Sta. Research Bull. 117, 39 pp.
- GIESE, T. G. 1975. The ecology of the middle Blue River valley, Summit County, Colorado, with an analysis of modifications due to powerline construction. M. A. Thesis, Univ. of Colorado, Boulder.
- GIRARD, M. M. 1985. The ecology and habitat type classification of native woodlands of southwestern North Dakota. Ph. D. Thesis, North Dakota State Univ., Fargo.
- GLENDENING, G. E. 1944. Some factors affecting cattle use of northern Arizona pine-bunchgrass ranges. USDA Forest Service Southwestern Forest and Range Expt. Sta., Tucson AZ, Research Report 6, 9 pp.
- GRAYBOSCH, R. A., and H. BUCHANAN. 1983. Vegetative (sic) types and endemic plants of the Bryce Canyon breaks. Great Basin Nat. 43(4):701-712.
- GRIFFITH, L. W., G. E. SCHUMAN, F. RAUZI, and R. E. BAUMGARTNER. 1984. Mechanical renovation of shortgrass prairie for increased herbage production. J. Range Manage. 38(1):7-10.
- HALL, F. C. 1973. Plant communities of the Blue Mountains in eastern Oregon and southeastern Washington. USDA Forest Service Pacific Northwest Region, Portland OR, R6 Area Guide 3-1, 62 pp.
- HAKE, D. R., J. POWELL, J. K. McPHERSON, T. J. CLAYPOOL, and G. L. DUNN. 1984. Water stress of tallgrass prairie plants in central Oklahoma. J. Range Manage. 37(2):147-151.
- HANKS, J. P., E. L. FITZHUGH, and S. R. HANKS. 1983. A habitat type classification system for ponderosa pine forests of northern Arizona. USDA Forest Service Genl. Tech. Rept. RM-97, 22 pp.
- HANNA, L. A. 1934. The major plant communities of the headwater area of the Little Laramie River, Wyoming. Univ. Wyoming Publ. Sci. Bot. 1(10):243-266.
- HANSEN, P. L., G. R. HOFFMAN, and A. J. BJUGSTAD. 1984. The vegetation of Theodore Roosevelt National Park, North Dakota: a habitat type classification. USDA Forest Service Genl. Tech. Rept. RM-113, 35 pp.

- HANSEN, P. L., and G. R. HOFFMAN. 1986. The vegetation of the Grand River/Cedar River, Sioux, and Ashland Divisions of the Custer National Forest: A habitat type classification. Univ. South Dakota, Dept. Biology, Vermillion SD, 255 pp.
- HANSEN, R. M., and I. K. GOLD. 1977. Blacktail prairie dogs, desert cottontails, and cattle trophic relations on shortgrass range. *J. Range Manage.* 30(3):210-214.
- HANSON, H. C. 1929. Range resources of the San Luis Valley. Colorado Agric. Expt. Sta. Bull. 335, 61 pp.
- HANSON, H. C. 1955. Characteristics of the *Stipa comata*-*Bouteloua gracilis*-*Bouteloua curtipendula* association in northern Colorado. *Ecology* 36(2): 269-280.
- HANSON, H. C., and E. DAHL. 1956. Some grassland communities in the mountain-front zone in northern Colorado. *Vegetatio* 7:249-270.
- HANSON, H. C., L. D. LOVE, and M. S. MORRIS. 1931. Effects of different systems of grazing by cattle upon a western wheat-grass type of range near Fort Collins, Colorado. *Colo. Agric. Expt. Sta. Bull.* 377, 82 pp.
- HANSON, H. C., and W. WHITMAN. 1938. Characteristics of major grassland types in western North Dakota. *Ecol. Monogr.* 8(1):59-114.
- HARNISS, R. O., and N. E. WEST. 1973. Vegetation patterns of the National Reactor Testing Station, southeastern Idaho. *Northwest Sci.* 47(1):30-43.
- HART, R. H., O. M. ABDALLA, D. H. CLARK, M. B. MARSHALL, M. H. HAMID, J. A. HAGER, and J. W. WAGGONER Jr. 1983. Quality of forage and cattle diets on the Wyoming high plains. *J. Range Manage.* 36(1):46-51.
- HART, R. H., J. W. WAGGONER Jr., D. H. CLARK, C. C. KALTENBACH, J. A. HAGER, and M. B. MARSHALL. 1983. Beef cattle performance on crested wheatgrass plus native range vs. native range alone. *J. Range Manage.* 36(1):38-40.
- HAYNES, C. M., and S. D. AIRD. 1981. The distribution and habitat requirements of the wood frog (*Ranidae: Rana sylvestris* Le Conte) in Colorado. Colorado Div. Wildlife Special Rept. 50, 29 pp.
- HAYWARD, H. E. 1928. Studies of plants in the Black Hills of South Dakota. *Bot. Gaz.* 85(4):353-412.
- HELM, D. 1982. Multivariate analysis of alpine snow-patch vegetation cover near Milner Pass, Rocky Mountain National Park, Colorado, U. S. A. *Arctic and Alpine Research* 14(2):87-95.
- HENDERSON, J. A., R. L. MAUK, D. L. ANDERSON, T. A. DAVIS, and T. J. KECK. 1977. Preliminary forest habitat types of the Uinta Mountains, Utah. Utah State Univ., Dept. of Forestry and Outdoor Recreation, 94 pp.
- HESS, K. 1981. Phyto-edaphic study of habitat types of the Arapaho-Roosevelt National Forest, Colorado. Ph. D. Dissertation, Colorado State University, Fort Collins, 558 pp.
- HESS, K., and R. R. ALEXANDER. 1986. Forest vegetation of the Arapaho and Roosevelt National Forests in central Colorado: A habitat type classification. USDA Forest Service Res. Paper RM-266, 48 pp.
- HESS, K., and C. H. WASSER. 1982. Grassland, shrubland, and forestland habitat types of the White River-Arapaho National Forest. Final Report, cooperative agreement no. 53-82FT-1-19, 335 pp.
- HIRONAKA, M., M. A. FOSBERG, and A. H. WINWARD. 1983. Sagebrush-grass habitat types of southern Idaho. Univ. Idaho Forest Wildlife and Range Expt. Sta. Bull. 35, 44 pp.
- HIRSCH, K. J. 1985. Habitat type classification of grasslands and shrublands of southwestern North Dakota. Ph. D. Thesis, North Dakota State Univ., Fargo, 281 pp. + append.
- HOFFMAN, G. R. 1960. The small mammal components of six climax plant associations in eastern Washington and northern Idaho. *Ecology* 41(3):571-572.

- HOFFMAN, G. R. 1982. A classification of forest habitat types of the White River National Forest, Colorado. Univ. South Dakota, Dept. of Biology, Vermillion SD, 123 pp.
- HOFFMAN, G. R., and R. R. ALEXANDER. 1976. Forest vegetation of the Bighorn Mountains, Wyoming: a habitat type classification. USDA Forest Service Research Paper RM-170, 38 pp.
- HOFFMAN, G. R., and R. R. ALEXANDER. 1980. Forest vegetation of the Routt National Forest in northwestern Colorado: a habitat type classification. USDA Forest Service Research Paper RM-221, 41 pp.
- HOLECHEK, J. L., and T. STEPHENSON. 1983. Comparison of big sagebrush vegetation in northcentral New Mexico under moderately grazed and grazing excluded conditions. *J. Range Manage.* 36(4):455-456.
- HOPKINS, W. E., and B. L. KOVALCHIK. 1983. Plant associations of the Crooked River National Grasslands. USDA Forest Service, Pacific Northwest Region, Publ. R6-Ecol.-133-1983, 98 pp.
- HOUSTON, D. B. 1976. The northern Yellowstone elk, III-IV: Vegetation and habitat relations. *Yellowstone National Park*, 444 pp.
- HOVER, E. I., and T. B. BRAGG. 1981. Effect of burning and mowing on an eastern Nebraska *Stipa-Andropogon* prairie. *Amer. Midl. Nat.* 105(1):13-18.
- HUGIE, V. K., H. B. PASSEY, and E. W. WILLIAMS. 1965. Soil taxonomic units and potential plant community relationships in a pristine range area of southern Idaho. *Amer. Soc. Agron., Special Publ.* 5:190-205.
- HULETT, G. K. and G. W. TOMANEK. 1969. Forage production on a clay upland range site in western Kansas. *J. Range Manage.* 22:270-276.
- HURD, R. M. 1961. Grassland vegetation in the Big Horn Mountains, Wyoming. *Ecology* 42(3):459-467.
- HURD, R. M., and N. A. KISSINGER Jr. 1952. Range investigations, Bighorn National Forest, Wyoming. *Rocky Mtn. Forest and Range Expt. Station Paper* 10, 34 pp.
- HURD, R. M., and F. W. POND. 1958. Relative preference and productivity of species on summer cattle ranges, Big Horn Mountains, Wyoming. *J. Range Management* 11(3):109-114.
- HYDE, R. M., and A. A. BEETLE. 1964. Range survey in Sunlight Basin, Park County, Wyoming. *Univ. Wyoming Agric. Expt. Sta. Bull.* 423, 42 pp.
- HYDER, D. N., R. E. BEMENT, E. E. REMENGA, and C. TERWILLIGER Jr. 1966. Vegetation-soils and vegetation-grazing relations from frequency data. *J. Range Management* 19:11-17.
- HYDER, D. N., and W. R. HOUSTON. 1972. Effects of massive nitrogen fertilization on mixed-grass prairie near Cheyenne, Wyoming. In: *USDA Agric. Research Serv., Central Plains Expt. Range, Ann. Rept. for 1971*, pp. 33-66.
- IRVINE, J. R., and N. E. WEST. 1979. Riparian tree species distribution and succession along the lower Escalante River, Utah. *Southwest Nat.* 24(2):331-346.
- JAMESON, D. A. 1966. Pinyon-juniper litter reduces growth of blue grama. *J. Range Manage.* 19(4):214-217.
- JEFFERIES, N. W. 1965. Herbage production on a Gambel oak range in southwestern Colorado. *J. Range Management* 18:212-213.
- JOHNSON, P. L., and W. D. BILLINGS. 1962. The alpine vegetation of the Beartooth Plateau in relation to cryopedogenic processes and patterns. *Ecol. Monogr.* 32(2):105-135.
- JOHNSON, W. M. 1945. Natural revegetation of abandoned crop land in the ponderosa pine zone of the Pikes Peak region in Colorado. *Ecology* 26(4):363-374.
- JOHNSON, W. M. 1962. Vegetation of high-altitude ranges in Wyoming as related to use by game and domestic sheep. *Univ. Wyoming Agric. Expt. Sta. Bull.* 387, 31 pp.



- JOHNSTON, B. C., and L. HENDZEL. 1985. Example of aspen treatment, succession, and management in Western Colorado. USDA Forest Service, Rocky Mtn. Region, Lakewood CO, 164 pp.
- JONES, G. J., and E. B. PETERSON. 1970. Plant species diversity in a woodland-meadow ecotone near Regina, Saskatchewan. Canadian J. Bot. 48:591-601.
- JONES, R. E. 1963. Identification and analysis of lesser and greater prairie chicken habitat. J. Wildlife Management 27(4):757-778.
- JORGENSEN, H. E. 1979. Vegetation of the Yellow Water Triangle, Montana. Montana Dept. of Fish and Game and USDI Bureau of Land Management, 57 pp.
- JOYCE, L. A. 1981. Climate/vegetation relationships in the northern Great Plains and the Wyoming north-central basins. Ph. D. Dissertation, Colorado State University, Fort Collins.
- JUDD, B. I. 1974. Plant succession of old fields in the dust bowl. Southwest. Nat. 19(3):227-239.
- JUDD, B. I., and M. L. JACKSON. 1939. Natural succession of vegetation on abandoned farm lands in the Rosebud soil area of western Nebraska. J. Amer. Soc. Agron. 31(6):541-557.
- KEAMMERER, W. R., and R. E. STOECKER. 1980. Vegetation and wildlife studies. Attachment to Draft Environmental Impact Statement, Mt. Emmons Project, Gunnison National Forest, Colorado, 161 pp.
- KEELER, K. H., A. T. HARRISON, and L. S. VESCIO. 1980. The flora and sandhills prairie communities of Arapaho Prairie, Arthur County, Nebraska. Prairie Nat. 12(3):65-78.
- KEIM, F. D., A. L. FROLIK, and G. W. BEADLE. 1932. Studies of prairie hay in north central Nebraska. Univ. Nebraska Agric. Expt. Sta., Lincoln, Research Bull. 60, 54 pp.
- KENNEDY, K. L. 1983. A habitat type classification of the pinyon-juniper woodlands of the Lincoln National Forest, New Mexico. In MOIR and HENDZEL, eds., pp. 54-61.
- KLATT, L. E., and D. HEIN. 1978. Vegetative differences among active and abandoned towns of black-tailed prairie dogs (*Cynomys ludovicianus*). J. Range Manage. 31(4):315-317.
- KLEMMEDSON, J. O. 1956. Interrelationships of vegetation, soils, and range condition induced by grazing. J. Range Management 9:134-138.
- KLEINMAN, L. H. 1973. Community characteristics of six burned aspen-conifer sites and their related annual use. M. S. Thesis, Brigham Young Univ., Provo, Utah, 46 pp.
- KLISH, M. W. 1977. The vegetation of Summit County, Colorado. M. S. Thesis, Colorado State University, Fort Collins.
- KNIGHT, D. H., and J. THILENIUS. 1975. Vegetation ecology. In: The Medicine Bow Project: Final report. Univ. Wyoming, Laramie, and Rocky Mtn. Forest and Range Expt. Sta., Fort Collins, pp. 37-59.
- KNOFF, F. L. 1985. Significance of riparian vegetation to breeding birds along an altitudinal cline. In: Johnson, R. R., et al., eds. (1985). Riparian ecosystems and their management. USDA Forest Service Genl. Tech. Rept. RM-120, pp. 105-111.
- KNOWLES, C. J. 1975. Range relationships of mule deer, elk and cattle in a rest-rotation grazing system during summer and fall. M. S. Thesis, Montana State Univ., Bozeman.
- KNOWLES, C. J. 1986. Some relationships of black-tailed prairie dogs to livestock grazing. Great Basin Nat. 46(2):198-203.
- KOMARKOVA, V. 1976. Alpine vegetation of the Indian Peaks area, Front Range, Colorado Rocky Mountains. Ph. D. Thesis, Univ. of Colorado, Boulder, 655 pp.
- KOMARKOVA, V. 1979. Alpine vegetation of the Indian Peaks area, Front Range, Colorado Rocky Mountains. Cramer, Vaduz, 591 pp.



- KOMARKOVA, V., and H. GORDON. 1982. The recovery of plant communities after disturbance along the Front Range, Colorado. Final Report, Colorado Commission on Higher Education, Denver, 300 pp. + appendices.
- KOMBEREC, T. J. 1976. Range relationships of mule deer, elk and cattle on a rest-rotation grazing system during winter and spring. M. S. Thesis, Montana State Univ., Bozeman.
- KOOIMAN, M., and Y. B. LINHART. 1986. Structure and change in herbaceous communities of four ecosystems in the Front Range, Colorado, U.S.A. Arctic Alpine Research 18(1):97-110.
- KOVACIC, D. A. 1983. Studies in the Front Range ponderosa pine ecosystem following infestation by the mountain pine beetle. Ph. D. Dissert., Colorado State Univ., Fort Collins, 190 pp.
- KOVACIC, D. A., M. I. DYER, and A. T. CRINGAN. 1985. Understory biomass in ponderosa pine following mountain pine beetle infestation. For. Ecol. Manage. 13:53-67.
- KRANTZ, J. J. 1971. A comparison of aspen and pine communities in the northern Black Hills. M. S. Thesis, South Dakota State Univ., Brookings, 52 pp.
- KRANTZ, J. J., and R. L. LINDER. 1973. Value of black hills forest communities to deer and cattle. J. Range Management 26(4):263-265.
- KUFELD, R. C. 1983. Responses of elk, mule deer, cattle, and vegetation to burning, spraying, and chaining of Gambel oak rangeland. Colorado Div. Wildlife Tech. Publ. 34, 47 pp.
- KUFELD, R. C., J. KLEIN, J. BROWN, and L. STEWART. 1975. Experimental improvement of oakbrush on deer and elk winter ranges -- Beaver Creek [Routt NF]. Colorado Div. Wildlife Game Range Investig. Proj. W-101-R-17, 24 pp.
- KUNZLER, L. M., K. T. HARPER, and D. B. KUNZLER. 1981. Compositional similarity within the oakbrush type in central and northern Utah. Great Basin Nat. 41(1):147-153.
- LANGENHEIM, J. H. 1972. Vegetation and environmental pattern in the Crested Butte area, Gunnison County, Colorado. Ecol. Monogr. 32(3):249-285.
- LARSON, F., and W. WHITMAN. 1938. A comparison of used and unused grassland mesas in the badlands of South Dakota. Ecology 23(4):438-445.
- LARSON, M. 1980. Vegetation system. In Black Hills National Forest Ecological Land Units Study, appendix C.
- LAWTON, P. M. 1979. An investigation of the environmental relationships of selected forest habitat types in northern Utah. M. S. Thesis, Utah State Univ., Logan, 101 pp.
- LEWIS, M. E. 1970. Alpine rangelands of the Uinta Mountains. Publisher not cited, 75 pp.
- LEWIS, M. E. 1975. Plant communities of the Jarbridge Mountain complex, Humboldt National Forest. USDA Forest Service, Intermountain Region, 22 pp.
- LIVINGSTON, R. B. 1949. An ecological study of the Black Forest, Colorado. Ecol. Monogr. 19(2):125-144.
- LIVINGSTON, R. B. 1952. Relict true prairie communities in central Colorado. Ecology 33(1):72-86.
- LONG, A. J., and L. L. IRWIN. 1982. Elk-cattle interactions in the Bighorn Mountains, Wyoming. In Nelson and Peek (1982), pp. 553-564.
- LUNDBERG, C. E. 1981. A moisture gradient in desert shrub communities in southwestern Wyoming, as revealed by ordination. Ph. D. Dissertation, Univ. Wyoming, Laramie, 182 pp.
- MACE, R. D., and G. N. BISSELL. 1986. Grizzly bear food resources in the floodplain and avalanche chutes of the Bob Marshall Wilderness, Montana. In: Proc. Grizzly Bear Habitat Symp. USDA Forest Service Genl. Tech. Rept. INT-207, pp. 78-91.
- MACKIE, R. J. 1970. Range ecology and relations of mule deer, elk, and cattle in the Missouri River Breaks, Montana. Wildlife Monogr. 20:5-79.

- MARQUISS, R., and R. LANG. 1959. Vegetational composition and ground cover of two natural relict areas and their associated grazed areas in the Red Desert of Wyoming. *J. Range Manage.* 12:104-109.
- MARR, J. 1967. Ecosystems of the east slope of the Front Range in Colorado. Univ. of Colorado Studies, Ser. Biol. 8:1-134.
- MAUK, R. L., and J. A. HENDERSON. 1984. Coniferous forest habitat types of northern Utah. USDA Forest Service Genl. Tech. Rept. INT-170, 89 pp.
- MACCRACKEN, J. G., L. E. ALEXANDER, and D. W. URESK. 1983. An important lichen of southeastern Montana rangelands. *J. Range Manage.* 36(1):35-37.
- MACCRACKEN, J. G., and D. W. URESK. 1984. Big game habitat use in southeastern Montana. *Prairie Nat.* 16(3):135-139.
- MACCRACKEN, J. G., D. W. URESK, and R. M. HANSEN. 1985. Vegetation and soils of burrowing owl nest sites in Conata Basin, South Dakota. *Condor* 87:152-154.
- MACCRACKEN, J. G., D. W. URESK, and R. M. HANSEN. 1983. Plant community variability on a small area in southeastern Montana. *Great Basin Nat.* 43(4):660-668.
- MCGINNIES, W. J., W. G. HASSELL, and C. H. WASSER. 1983. A summary of range seeding trials in Colorado. Colorado State Univ. Coop. Extens. Serv. Special Series No. 21, 283 pp.
- MCGINNIES, W. J. 1984. Chemically thinning blue grama range for increased forage and seed production. *J. Range Manage.* 37(5):412-415.
- MCGINNIES, W. J., L. W. OSBORN, and W. A. BERG. 1976. Plant-microsite relationships on a saltgrass meadow. *J. Range Management* 29(5): 395-400.
- MCILVAIN, E. H., and M. C. SHOOP. 1961. Stocking rates and grazing systems for producing forage and beef and sand sage rangelands...a 20-year study. Preliminary outline, typescript, 68 pp.
- MCLEAN, A. 1970. Plant communities of the Similkameen Valley, British Columbia, and their relationships to soils. *Ecol. Monogr.* 40(4): 403-423.
- MATHIASSEN, R. L., E. A. BLACK, and C. B. EDMISTER. 1986. Estimates of site potential for Douglas-fir based on site index for several southwestern habitat types. *Great Basin Nat.* 46(2):277-280.
- MAY, D. E., and P. J. WEBBER. 1982. Spatial and temporal variation of the vegetation and its productivity, Niwot Ridge, Colorado. In HALFPENNY, J. C., ed., *Ecological Studies in the Colorado Alpine*. Univ. Colorado Inst. of Arctic and Alpine Res., Occasional Paper 37, pp. 35-62.
- MILLER, S. 1963. Influence of season of grazing and intensity of grazing on vegetative composition and yields. *Amer. Soc. Range Manage.*, 16th Ann. Meeting, Rapid City SD, Abstracts, pp. 47-48.
- MOIR, W. H. 1966. Influence of ponderosa pine on herbaceous vegetation. *Ecology* 47(6):1045-1048.
- MOIR, W. H. 1967. The subalpine tall grass, *Festuca thurberi*, community of Sierra Blanca, New Mexico. *Southwest. Nat.* 12(3):321-328.
- MOIR, W. H. 1969. The lodgepole pine zone in Colorado. *Amer. Midl. Nat.* 81(1):87-98.
- MOIR, W. H. 1969. Steppe communities in the foothills of the Colorado Front Range and their relative productivities. *Amer. Midl. Nat.* 81(2): 331-340.
- MOIR, W. H. 1979. Soil-vegetation patterns in the central Peloncillo Mountains, New Mexico. *Amer. Midl. Nat.* 102(2):317-331.
- MOIR, W. H., and L. HENDZEL. 1983. Proceedings of the workshop on southwestern habitat types, April 6-8, Albuquerque, New Mexico. USDA Forest Service, Southwestern Region, Albuquerque, 110 pp.
- MOIR, W. H., and J. A. LUDWIG. 1979. A classification of spruce-fir and mixed conifer habitat types of Arizona and New Mexico. USDA Forest Service Research Paper RM-207, 47 pp.

- MOIR, W. H., and M. J. TRILICA. 1976. Plant communities and vegetation pattern as affected by various treatments in shortgrass prairie of northeastern Colorado. *Southwest. Nat.* 21(3):359-371.
- MORDEN, C., J. D. BROTHERRSON, and B. N. SMITH. 1986. Ecological differences of  $C_3$  and  $C_4$  plant species from central Utah in habitats and mineral composition. *Great Basin Nat.* 46(1):140-147.
- MORGAN, M. D. 1969. Ecology of aspen in Gunnison County, Colorado. *Amer. Midl. Nat.* 82(1):204-228.
- MUEGGLER, W. F. 1972. Plant development and yield on mountain grasslands in southwestern Montana. USDA Forest Service Res. Paper INT-124, 20 pp.
- MORRISON, L. C., J. D. DuBOIS, and L. A. KAPUSTKA. 1986. The vegetational response of a Nebraska sandhills grassland to a naturally occurring fall burn. *Prairie Nat.* 18(3):179-184.
- MUEGGLER, W. F. 1983. Variation in production and seasonal development of mountain grasslands in western Montana. USDA Forest Service Res. Paper INT-316, 16 pp.
- MUEGGLER, W. F., and R. B. CAMPBELL Jr. 1982. Aspen community types on the Caribou and Targhee National Forests in southeastern Idaho. USDA Forest Service Research Paper INT-294, 32 pp.
- MUEGGLER, W. F., and R. B. CAMPBELL Jr. 1986. Aspen community types of Utah. USDA Forest Service Res. Paper INT-362, 69 pp.
- MUEGGLER, W. F., and W. L. STEWART. 1980. Grassland and shrubland habitat types of western Montana. USDA Forest Service Genl. Tech. Rept. INT-66, 154 pp.
- MUELLER-DOMBOIS, D., and H. ELLENBERG. 1974. Aims and methods of vegetation ecology. John Wiley, New York, 547 pp.
- NELSON, J. L. 1961. Composition and structure of the principal woody vegetation types in the North Dakota badlands. M. S. Thesis, North Dakota State Univ., Fargo, 195 pp.
- NELSON, L., and J. M. PEEK, eds. 1982. Wildlife-livestock relationships symposium. Univ. Idaho, Moscow, Dept. of Forestry Wildlife and Range Expt. Sta., 614 pp.
- NICHOLSON, R. A., and G. K. HULETT. 1969. Remnant grassland vegetation in the central Great Plains of North America. *J. Ecol.* 57:599-612.
- NICKERSON, M. F., G. E. BRINK, and C. FEDDEMA. 1976. Principal range plants of the central and southern Rocky Mountains: names and symbols. USDA Forest Service Genl. Tech. Rept. RM-20, 121 pp.
- NOSTE, N. V. 1982. Vegetation response to spring and fall burning for wildlife habitat improvement. In BAUMGARTNER, D. M., ed., Site Preparation and Fuels Management on Steep Terrain. Wash. State Univ., Pullman, pp. 125-132.
- ODGEN, P. R. 1984. Herbaceous standing crop as a function of seasonal precipitation and ponderosa pine overstory. Final report, contract 53-82FT-0-115. Univ. Arizona, Tucson, 31 pp.
- OLSON, R. A., and GERHART, W. A. 1982. A physical and biological characterization of riparian habitat and its importance to wildlife in Wyoming. Wyoming Fish and Game Dept., Cheyenne, vol. 1, 188 pp.
- OSTLER, W. K., K. T. HARPER, K. B. MCKNIGHT, and D. C. ANDERSON. 1982. The effects of increasing snowpack on a subalpine meadow in the Uinta Mountains, Utah, U.S.A. *Arctic Alpine Research* 14(3):203-214.
- OSBORN, B., and P. F. ALLAN. 1949. Vegetation of an abandoned prairie-dog town in tall grass prairie. *Ecology* 30(3):322-332.
- PASE, C. E., and J. F. THILENIUS. 1968. Composition, production, and site factors of some grasslands in the Black Hills of South Dakota. USDA Forest Service Res. Note RM-103, 8 pp.
- PAULSEN, H. A. Jr. 1969. Forage values on a mountain grassland-aspen range in western Colorado. *J. Range Management* 22:102-107.

- PAULSEN, H. A. Jr. 1970. Competition and successional patterns on Thurber fescue grasslands of western U. S. A. Proc. 11th Intl. Grassland Congr. 11:662-665.
- PAYNE, G. F. 196X. The effect of 2,4-D on sagebrush and associated vegetation on the Beaverhead National Forest, Montana. Final report to U. S. Forest Service, 47 pp. + appendix.
- PEEK, J. M., F. D. JOHNSON, and N. N. PENCE., 1978. Successional trends in a ponderosa pine/bitterbrush community related to grazing by livestock, wildlife, and to fire. J. Range Manage. 31(1):49-53.
- PEET, R. K. 1975. Forest vegetation of the east slope of the northern Colorado Front Range. Ph. D. Thesis, Cornell Univ., 661 pp.
- PENFOUND, W. T. 1964. The relation of grazing to plant succession in the tall grass prairie. J. Range Manage. 17:256-260.
- PFISTER, R. D. 1972. Vegetation and soils in the subalpine forests of Utah. Ph. D. Thesis, Washington State Univ., 98 pp.
- PFISTER, R. D., B. L. KOVALCHIK, S. F. ARNO, and R. C. PRESBY. 1977. Forest habitat types of Montana. USDA Forest Service Genl. Tech. Rept. INT-34, 174 pp.
- PHILLIPS, C. M. 1977. Willow carrs of the upper Laramie River valley, Colorado. M. S. Thesis, Colorado State Univ., Ft. Collins, 71 pp.
- POJAR, J., R. TROWBRIDGE, and D. COATES. 1984. Ecosystem classification and interpretation of the sub-boreal spruce zone, Prince Rupert forest region, British Columbia. Brit. Columb. Min. Forests Land Manage. Rept. 17, 319 pp.
- POOL, R. J. 1914. A study of the vegetation of the sandhills of Nebraska. Minnesota Bot. Stud. 3(4):190-312.
- POWELL, D. C. 1985. Aspen community types of the Pike and San Isabel National Forests. Pike and San Isabel National Forests, Pueblo CO, 77 pp.
- QUINNILD, C. L., and H. E. COSBY. 1958. Relicts of climax vegetation on two mesas in western North Dakota. Ecology 39(1):29-32.
- RADLOFF, D. L. 1983. Wildland classification with multivariate analysis and remote sensing techniques. Ph. D. Dissert., Colorado State Univ., Fort Collins, 106 pp.
- RALSTON, R. D., and R. L. DIX. 1966. Green herbage production of native grasslands in the Red River Valley. Proc. North Dakota Acad. Sci. 20:57-66.
- RAMALEY, F. 1939. Sand-hill vegetation of northeastern Colorado. Ecol. Monogr. 9(1):3-31.
- RASMUSSEN, L. L., and J. D. BROTHERRSON. 1986. Response of winterfat (*Ceratoides lanata*) communities to release from grazing pressure. Great Basin Nat. 46(1):148-156.
- RAUZI, F., and M. L. FAIRBOURN. 1983. Effects of annual applications of low N fertilizer rates on a mixed grass prairie. J. Range Manage. 36(3):359-362.
- RAUZI, F., C. L. FLY, and E. J. DYKSTERHUIS. 1968. Water intake on mid-continent rangelands as influenced by soil and plant cover. USDA Tech. Bull. 1390, 58 pp.
- REAM, R. R. 1964. The vegetation of the Wasatch Plateau, Utah and Idaho. Ph. D. Thesis, Univ. of Wisconsin, 134 pp.
- REDMANN, R. E. 1975. Production ecology of grassland plant communities in western North Dakota. Ecol. Monogr. 45(1):83-106.
- REED, R. M. 1971. Aspen forests of the Wind River Mountains, Wyoming. Amer. Midl. Nat. 86:327-343.
- REED, R. M. 1976. Coniferous forest habitat types of the Wind River Mountains, Wyoming. Amer. Midl. Nat. 95:159-173.
- REICHHARDT, K. L. 1982. Succession of abandoned fields on the shortgrass prairie, northwestern Colorado. Southwest. Nat. 27(3):299-304.



- REID, E. H., and L. D. LOVE. 1954. Range-watershed conditions and recommendations for management, Elk Ridge and Lower Elk Ridge cattle allotments, Roosevelt National Forest, Colorado. USDA Forest Service, Washington DC, 123 pp. mimeo.
- RICE, E. L., and S. K. PANCHOLY. 1972. Inhibition of nitrification by climax ecosystems. *Amer. J. Bot.* 59(10):1033-1040.
- RICE, E. L., and S. K. PANCHOLY. 1973. Inhibition of nitrification by climax ecosystems. II. Additional evidence and possible role of tannins. *Amer. J. Bot.* 60(7):691-702.
- RICKARD, W. H. 1960. The distribution of small mammals in relation to the climax vegetation mosaic in eastern Washington and northern Idaho. *Ecology* 41(1):99-106.
- RICKARD, W. H. 1975. Experimental cattle grazing in a relatively undisturbed shrub-steppe community. *Northwest Sci.* 59(1):66-72.
- RICKARD, W. H., and R. H. SAUER. 1982. Primary production and canopy cover in bitterbrush-cheatgrass communities. *Northwest Sci.* 56(3):250-256.
- RING, C. B., R. A. NICHOLSON, and J. L. LAUNCHBAUGH. 1985. Vegetational traits of patch-grazed rangeland in west-central Kansas. *J. Range Manage.* 38(1):51-55.
- ROBERTSON, D. R., J. L. NIELSEN, and N. H. LANE. 1966. Vegetation and soils of alkali sagebrush and adjacent big sagebrush ranges in North Park, Colorado. *J. Range Management* 19:17-20.
- ROMINGER, J. M., and L. A. PAULIK. 1983. A floristic inventory of the plant communities of the San Francisco Peaks Research Natural Area. USDA Forest Service Genl. Tech. Rept. RM-96, 9 pp.
- ROMME, W. H. 1979. Fire and landscape diversity in subalpine forests of Yellowstone National Park. Ph. D. Dissertation, Univ. Wyoming, Laramie.
- ROTTMAN, M. L. I. 1984. A floristic analysis of three alpine basins in the northern San Juan Mountains, Colorado. Ph. D. Thesis, Univ. of Colorado, Denver.
- ROTTMAN, M. L., and E. L. HARTMAN. 1985. Tundra vegetation of three cirque basins in the northern San Juan Mountains, Colorado. *Great Basin Nat.* 45(1):87-93.
- ROUNDY, B. A., R. A. EVANS, and J. A. YOUNG. 1984. Surface soil and seedbed ecology in salt-desert plant communities. In: Tiedemann et al. (1984), pp. 66-74.
- RUYLE, G. B., J. E. BOWNS, and A. F. SCHLUNDT. 1983. Estimating snowberry (*Symphoricarpos oreophilus*) utilization by sheep from twig diameter-weight relations. *J. Range Manage.* 36(4):472-474.
- SABINSKE, D. W., and D. H. KNIGHT. 1978. Variation within the sagebrush vegetation of Grand Teton National Park, Wyoming. *Northwest Sci.* 52(3):195-204.
- SAMUEL, M. J., and G. S. HOWARD. 1982. Botanical composition of summer cattle diets on the Wyoming high plains. *J. Range Manage.* 35(3):305-308.
- SARVIS, J. T. 1941. Grazing investigations on the northern Great Plains. North Dakota Agric. Expt. Sta., Fargo, Bull. 308, 110 pp.
- SCHLATTERER, E. F. 1972. A preliminary description of plant communities found on the Sawtooth, White Cloud, Boulder, and Pioneer Mountains. USDA Forest Service, Intermountain Region, Ogden, Utah, 111 pp.
- SCHROEDER, R. E. 1977. Species composition changes on three range types under two grazing systems. M. S. Thesis, Colorado State Univ., Fort Collins.
- SCHUMACHER, C. M., and M. D. ATKINS. 1965. Reestablishment and use of grass in the Morton County, Kansas, Land Utilization Project. USDA Soil Conserv. Serv. SSC-TP-146, 14 pp.
- SCHWAN, H. E. 1951. Report on proposed Bull Elk Park Natural Area. Typescript, 9 pp.



- SENFT, R. L., L. R. RITTENHOUSE, and R. G. WOODMANSEE. 1983. The use of regression models to predict spatial pattern of cattle behavior. *J. Range Manage.* 36(5):553-557.
- SENFT, R. L., L. R. RITTENHOUSE, and R. G. WOODMANSEE. 1985. Factors influencing patterns of cattle grazing behavior on shortgrass steppe. *J. Range Manage.* 38(1):82-87.
- SEVERSON, K. E. 1963. A description and classification, by composition, of the aspen stands in the Sierra Madre Mountains, Wyoming. M. S. Thesis, Univ. Wyoming, Laramie, 94 pp.
- SEVERSON, K. E., M. MAY, and W. HEPWORTH. 1968. Food preferences, carrying capacities, and forage competition between antelope and domestic sheep in Wyoming's Red Desert. *Wyoming Agric. Expt. Sta. Science Monogr.* 10, 51 pp.
- SEVERSON, K. E., and J. F. THILENIUS. 1976. Classification of quaking aspen stands in the Black Hills and Bear Lodge Mountains. *USDA Forest Service Research Paper RM-166*, 24 pp.
- SHEPHERD, H. R. 1975. Vegetation of two dissimilar bighorn sheep ranges in Colorado. *Colorado Div. Wildlife Division Report* 4, 233 pp.
- SHIFLET, T. N. 1973. Range sites and soils in the United States. *Proc. Third Workshop U. S.-Australia Rangelands Panel*, Tucson, Arizona, pp. 26-33.
- SIEG, C. H., D. W. URESK, and R. M. HANSEN. 1983. Plant-soil relationships on bentonite mine spoils and sagebrush-grassland in the northern High Plains. *J. Range Manage.* 36(3):289-294.
- SLOAN, C. E. 1970. Biotic and hydrologic variable in prairie potholes in North Dakota. *J. Range Manage.* 23:260-263.
- SMITH, D. R. 1969. Vegetation, soils, and their interrelationships, at timberline in the Medicine Bow Mountains, Wyoming. *Wyoming Agric. Expt. Sta. Science Monogr.* 17, 13 pp.
- SMITH, E. L. Jr. 1966. Soil-vegetation relationships of some *Artemisia* types in North Park, Colorado. Ph. D. Dissertation, Colorado State Univ., Fort Collins.
- SMOLIAK, S. 1965. A comparison of grazed and lightly grazed *Stipa-Bouteloua* prairie in southeastern Alberta. *Can. J. Plant Sci.* 45:270-275.
- SMOLIAK, S. 1986. Influence of climatic conditions on production of *Stipa-Bouteloua* prairie over a 50-year period. *J. Range Manage.* 39(2):100-103.
- SOCIETY FOR RANGE MANAGEMENT. 1974. A glossary of terms used in range management. *Society for Range Management*, Denver, Colorado, 36 pp.
- SPENCER, J. P. 1975. The effects of weather modification on alpine plant communities in the San Juan Mountains, Colorado. M. A. Thesis, Univ. Colorado, Boulder.
- STAUFFER, D. F., and S. R. PETERSON. 1982. Seasonal habitat relationships of ruffed and blue grouse in southeastern Idaho. *Univ. Idaho Forest Wildl. Range Expt. Sta., Moscow, Idaho*, final report, 138 pp.
- STEELE, R., S. V. COOPER, D. M. ONDOV, and R. D. PFISTER. 1983. Forest habitat types of eastern Idaho-western Wyoming. *USDA Forest Service Genl. Tech. Rept. INT-144*, 122 pp.
- STEELE, R., R. D. PFISTER, R. A. RYKER, and J. A. KITTAMS. 1982. Forest habitat types of central Idaho. *USDA Forest Service Genl. Tech. Rept. INT-114*, 138 pp.
- STEEN, O. A., and R. L. DIX. 1974. A preliminary classification of Colorado subalpine forests. *Colorado State Univ., Dept. of Bot. and Plant Pathology*, 9 pp.
- STEINAUER, G. A. 1984. A classification of the *Cercocarpus montanus*, *Quercus macrocarpa*, *Populus tremuloides*, and *Picea glauca* habitat types of the Black Hills National Forest. M. A. Thesis, Univ. South Dakota, Vermillion, 95 pp.

STEINHOFF, H. W. 1978. Management of Gambel oak associations for wildlife and livestock. USDA Forest Service Rocky Mountain Region, 119 pp.

STEINHOFF, H. W., and J. D. IVES, eds. 1976. Ecological impacts of snowpack augmentation in the San Juan Mountains of Colorado. USDI Bureau of Reclamation, Denver, Colorado, 489 pp.

STEWART, D. G. 1984. Vegetation-environment systems of Campbell County, Wyoming, with application to reclamation. Ph. D. Thesis, Colorado State Univ., Fort Collins, 299 pp.

STRASIA, C. A., M. THORN, R. W. RICE, and D. R. SMITH. 1970. Grazing habits, diet, and performance of sheep on alpine ranges. J. Range Management 23:201-208.

STRONG, L. L. 1980. Estimating phytomass production of habitat types on sagebrush steppe. M. S. Thesis, Colorado State Univ., Fort Collins.

STRONG, L. L., R. W. DANA, and L. H. CARPENTER. 1983. Estimating phytomass of sagebrush from microdensitometer data. Photogramm. Engr. and Remote Sensing 51(4):467-474.

STURGES, D. L. 1968. Evapotranspiration at a Wyoming mountain bog. J. Soil Water Conserv. 23(1).

SWEENEY, J. R. 1975. Effects of snow on oak brush. Ph. D. Dissertation, Colorado State Univ., Fort Collins.

TAYLOR, E. 1975. Pronghorn carrying capacity of Wyoming's Red Desert. Wyoming Game and Fish Dept. Wildl. Tech. Report 3, 65 pp.

TAYLOR, J. E., and T. L. HOLST. 1976. Grass and shrub plant community classification for the Ashland Division, Custer National Forest. Final report, contract. USDA Forest Service, Custer National Forest, 55 pp. + appendix.

TERWILLIGER, C. Jr., and E. L. SMITH. 1978. Range resource types in North Park, Colorado. Colorado State Univ. Range Sci Dept. Series 32, 48 pp.

TERWILLIGER, C. Jr., and J. A. TIEDEMAN. 1978. Habitat types of the mule deer critical winter range and adjacent steppe region of Middle Park, Colorado. Final report. Rocky Mountain Forest and Range Expt. Sta., Fort Collins, Colorado, 108 pp.

THILENIUS, J. F. 1972. Classification of deer habitat in the ponderosa pine forest of the Black Hills, South Dakota. USDA Forest Service Res. Paper RM-91, 28 pp.

THILENIUS, J. F. 1975. Plant production of three high-elevation ecosystems. In: KNIGHT, D. H., ed., The Medicine Bow Project, pp. 60-75, 385-397.

THILENIUS, J. F., and D. R. SMITH. 1985. Vegetation and soils of an alpine range in the Absaroka Mountains, Wyoming. USDA Forest Service Genl. Tech. Rept. RM-121, 18 pp.

THILENIUS, J. F., D. R. SMITH, and G. R. BROWN. 1974. Effect of 2,4-D on composition and production of an alpine plant community in Wyoming. J. Range Management 27(2):140-142.

THATCHER, A. P. 1959. Distribution of sagebrush as related to site differences in Albany County, Wyoming. J. Range Management 12:55-61.

TIEDEMAN, J. A. 1978. Phyto-edaphic classification of the Piceance Basin. Ph. D. Dissertation, Colorado State Univ., Fort Collins, 281 pp.

TIEDEMANN, A. R., E. D. McARTHUR, H. C. STUTZ, R. STEVENS, and K. L. JOHNSON, compilers. 1984. Proceedings -- symposium on the biology of Atriplex and related Chenopods. USDA Forest Service Genl. Tech. Rept. INT-172, 309 pp.

TISDALE, E. W. 1947. The grasslands of the southern interior of British Columbia. Ecology 28(4):346-382.

TISDALE, E. W., M. HIRONAKA, and M. A. FOSBERG. 1965. An area of pristine vegetation in Craters of the Moon National Monument, Idaho. Ecology 46(3):349-352.

TOLSTEAD, W. L. 1941. Plant communities and secondary succession in north-central South Dakota. Ecology 22(3):322-328.

- TOLSTEAD, W. L. 1942. Vegetation of the northern part of Cherry County, Nebraska. *Ecol. Monogr.* 12(3):257-292.
- TOLSTEAD, W. L. 1947. Woodlands in northwestern Nebraska. *Ecology* 28(2):180-188.
- TOWNE, G., and C. OWENSBY. 1984. Long-term effects of annual burning at different dates on ungrazed Kansas tallgrass prairie. *J. Range Manage.* 36(5): 392-397.
- TURNER, G. T. 1969. Responses of mountain grassland vegetation to gopher control, reduced grazing, and herbicide. *J. Range Management* 22:377-383.
- TWEIT, S. J., and K. E. HOUSTON. 1980. Grassland and shrubland habitat types of the Shoshone National Forest. USDA Forest Service, Shoshone National Forest, Cody, Wyoming, 143 pp.
- UNGAR, I. A. 1964. A phytosociological analysis of the Big Salt Marsh, Stafford County, Kansas. *Trans. Kansas Acad. Sci.* 67(1):50-64.
- UNGAR, I. A. 1967. Vegetation-soil relationships on saline soils in northern Kansas. *Amer. Midl. Nat.* 78(1):98-120.
- UNGAR, I. A. 1968. Species-soil relationships on the Great Salt Plains of northern Oklahoma. *Amer. Midl. Nat.* 80(2):392-406.
- UNGAR, I. A. 1970. Species-soil relationships on sulfate dominated soils of South Dakota. *Amer. Midl. Nat.* 83(2):343-357.
- UNGAR, I. A. 1974. Halophyte communities of Park County, Colorado. *Bull. Torrey Bot. Club* 101(3):145-152.
- UNGAR, I. A. 1974. Inland halophytes of the United States, In Reimold, R. J., and W. H. Queen, eds. (1974). *Ecology of Halophytes*. Academic Press, New York, pp. 235-305.
- UNGAR, I. A., W. HOGAN, and M. MCCLELLAND. 1969. Plant communities of saline soil at Lincoln, Nebraska. *Amer. Midl. Nat.* 82(2):564-577.
- URESK, D. W. 1984. Black-tailed prairie dog food habits and forage relationships in western South Dakota. *J. Range Manage.* 37(4):325-329.
- U. S. DEPARTMENT OF INTERIOR. 1974. Ecosystem description. In Final Environmental Impact Statement, Coal Resources in the Eastern Powder River Basin of Wyoming, Appendix D.
- VAN HAVEREN, B. P. 1983. Soil bulk density as influenced by grazing intensity and soil type on a shortgrass prairie site. *J. Range Manage.* 36(5): 586-588.
- VASS, A. F., and R. LANG. 1938. Vegetative composition, density, grazing capacity, and grazing land value in the Red Desert Area. *Univ. Wyoming Agric. Expt. Sta. Bull.* 229, 72 pp.
- VEBLEN, T. T. 1986. Treefalls and the coexistence of conifers in subalpine forests of the central Rockies. *Ecology* 67(3):644-649.
- WAMBOLT, C. L., and G. F. PAYNE. 1986. An 18-year comparison of control methods for Wyoming big sagebrush in southwestern Montana. *J. Range Manage.* 39(4):314-319.
- WARD, A. L. 1985. Little Snake River KRCRA elk study: Final report. USDA Forest Service, Rocky Mtn. For. Range Expt. Sta., Laramie WY, 188 pp.
- WASSER, C. H., and K. HESS. 1982. The habitat types of Region II, U. S. Forest Service: a synthesis. Final report. USDA Forest Service, Rocky Mountain Forest and Range Expt. Sta., 140 pp.
- WEAVER, J. E., and F. W. ALBERTSON. 1944. Nature and degree of recovery of grassland from the great drought of 1933 to 1940. *Ecol. Monogr.* 14(4):393-479.
- WEAVER, J. E., and T. J. FITZPATRICK. 1934. The Prairie. *Ecol. Monogr.* 4(2):109-295.
- WEAVER, J. E., and G. W. TOMANEK. 1951. Ecological studies in a midwestern range. *Univ. Nebraska, Nebraska Conserv. Bull.* 31, 82 pp.
- WEBBER, P. J., J. C. EMERICK, D. C. E. MAY, and V. KOMARKOVA. 1976. The impacts of increased snowfall on alpine vegetation. In Steinhoff and Ives (1976), pp. 201-264.

- WEST, N. E., F. D. PROVENZA, P. S. JOHNSON, and M. K. OWENS. 1984. Vegetation change after 13 years of livestock grazing exclusion on sagebrush semidesert in west central Utah. *J. Range Manage.* 37(3):262-264.
- WHIPPLE, S. A. 1978. The relationship of buried, germinating seeds to vegetation in an old-growth Colorado subalpine forest. *Canadian J. Bot.* 56:1505-1509.
- WHIPPLE, S. A., and R. L. DIX. 1979. Age structure and successional dynamics of a Colorado subalpine forest. *Amer. Midl. Nat.* 101(1):142-158.
- WHITE, A. S. 1985. Presettlement regeneration patterns in a southwestern ponderosa pine stand. *Ecology* 66(2):589-594.
- WHITE, R. S., and P. O. CURRIE. 1983. The effects of prescribed burning on silver sagebrush. *J. Range Manage.* 36(5):611-613.
- WHITE, R. S., and P. O. CURRIE. 1984. Phenological development and water relations in plains silver sagebrush. *J. Range Manage.* 37(6):503-507.
- WHITMAN, W. C. 1979. Analysis of grassland vegetation of selected key areas in southwestern North Dakota. Report to North Dakota Regional Environ. Assessment Program. North Dakota State Univ., Fargo, 199 pp.
- WHITMAN, W. C., and E. A. HELGESON. 1946. Range vegetation studies. North Dakota Agric. Expt. Sta. Bull. 340, 43 pp.
- WHYSONG, G. L., and H. G. FISSER. 1970. Phytosociological measurements with frequency, density, and basal area data on sagebrush-grass ranges in western Wyoming. *Wyoming Agric. Expt. Sta. Sci. Rept.* 265, 40 pp.
- WINN, D. S. 1976. Terrestrial vertebrate fauna and selected coniferous forest habitat types on the north slope of the Uinta Mountains. USDA Forest Service, Wasatch National Forest, 145 pp.
- WIRSING, J. M. 1970. Habitat characterization in lodgepole pine stands by moisture stress measurements. M. S. Thesis, Colorado State Univ., Fort Collins.
- WIRSING, J. M. 1973. Forest vegetation in southeastern Wyoming. M. S. Thesis, Washington State Univ., 170 pp.
- WIRSING, J. M., and R. R. ALEXANDER. 1975. Forest habitat types on the Medicine Bow National Forest, southeastern Wyoming: preliminary report. USDA Forest Service Genl. Tech. Rept. RM-12, 11 pp.
- WOOTEN, S. A. 1980. Vegetation recovery following disturbance on the Central Plains Experimental Range. M. S. Thesis, Colorado State Univ., Fort Collins.
- WRIGHT, H. E. Jr., A. M. BENT, B. S. HANSEN, and L. J. MAHER Jr. 1973. Present and past vegetation of the Chuska Mountains, northwestern New Mexico. *Geol. Soc. Amer. Bull.* 84:1155-1180.
- WRIGHT, J. C., and E. A. WRIGHT. 1948. Grassland types of south central Montana. *Ecology* 29(4):449-460.
- YOUNGBLOOD, A. P. 1984. Coniferous forest habitat types of central and southern Utah. USDA Forest Service Genl. Tech. Rept. INT- , review draft, 302 pp.
- YOUNGBLOOD, A. P., and R. L. MAUK. 1985. Coniferous forest habitat types of central and southern Utah. USDA Forest Service Genl. Tech. Rept. INT-187, 89 pp.
- YOUNGBLOOD, A. P., and W. F. MUEGLER. 1981. Aspen community types on the Bridger-Teton National Forest in western Wyoming. USDA Forest Service Research Paper INT-272, 34 pp.
- YOUNGBLOOD, A. P., W. G. PADGETT, and A. H. WINWARD. 1985. Riparian community type classification of eastern Idaho-western Wyoming. USDA Forest Service, Intermountain Region, Ogden UT, publ. R4-Ecol-85-1, 78 pp.



RIPARIAN AND OTHER HIGH-WATER-TABLE PLANT ASSOCIATIONS  
OF THE ROCKY MOUNTAIN REGION

| DOMINANT LIFE FORM             |                    | DOMINANT LIFE FORM            |                                 |
|--------------------------------|--------------------|-------------------------------|---------------------------------|
| PLANT SERIES                   |                    | PLANT SERIES                  |                                 |
| PLANT ASSOCIATION <sup>a</sup> |                    | PLANT ASSOCIATES <sup>b</sup> |                                 |
|                                | PHASE <sup>c</sup> | CODE                          | PHASE <sup>c</sup>              |
| C                              |                    | 0                             | CONIFEROUS FORESTS              |
| Abco                           |                    | 001                           | white fir/                      |
| Abco-Psme/Acgl                 | Alint              | 00101-3                       | thinleaf alder                  |
| Abco-Psme/Quga                 | Gatr2              | 00105-3                       | sweetscented bedstraw           |
|                                | Pamy               | 00105-4                       | myrtle pachistima               |
| Abla-Pienl                     |                    | 003                           | subalpine fir-Engelmann spruce/ |
| Abla-Pienl/Caca                |                    | 00305                         | bluejoint reedgrass             |
| Abla-Pienl/Meci                |                    | 00306                         | mountain bluebells              |
| Abla-Pienl/Setr                |                    | 00316                         | arrowleaf groundsel             |
| Pienl                          |                    | 004                           | Engelmann spruce/               |
| Pienl/Calel                    |                    | 00402                         | marsh-marigold                  |
| Pienl/Cadi                     |                    | 00403                         | sedge                           |
| Pienl-Pipu/Gatr2               |                    | 00405                         | sweetscented bedstraw           |
| Pigl                           |                    | 005                           | white spruce/                   |
| Pigl/Cape4                     |                    | 00501                         | Peck sedge                      |
| "Pigl/Cadi"                    |                    |                               | twoseed sedge                   |
| Pipu                           |                    | 006                           | blue spruce/                    |
| Pipu/Alint                     |                    | 00605                         | thinleaf alder                  |
| Pipu/Amal-Swse                 | Amal               | 00601-0                       | Saskatoon serviceberry          |
|                                | Swse               | 00601-1                       | redosier dogwood                |
| Pipu/Arco2                     |                    | 00602                         | heartleaf arnica                |
| Pipu-Pienl/Eqar                |                    | 00611                         | field horsetail                 |
| Pipo                           |                    | 006                           | ponderosa pine/                 |
| Pipo/Quga                      | Acne               | 01121-5                       | box-elder                       |
| D                              |                    | 1                             | DECIDUOUS FORESTS               |
| Frpe                           |                    | 107                           | green ash/                      |
| Frpe/Pavi                      | Pavi               | 10702-0                       | chokecherry                     |
|                                | Casp               | 10702-1                       | Sprengel sedge                  |
| Frpe/Syoc                      | Syoc               | 10701-0                       | western snowberry               |
|                                | Calo               | 10701-1                       | prairie sandreed                |
| Osvi                           |                    | 102                           | eastern hophornbeam/            |
| Osvi/Crsu                      |                    | 10202                         | fleshy hawthorn                 |
| Osvi-Quma/sparse               |                    | 10203                         | bur oak/sparse understory       |
| Poan3                          |                    | 103                           | narrowleaf cottonwood/          |
| Poan3/Alint-Swse               |                    | 10306                         | alder-redosier dogwood          |
| Poan3/Amal                     | Amal               | 10301-0                       | Saskatoon serviceberry          |
|                                | Acne               | 10301-1                       | box-elder                       |
| Poan3/Befo-RIBE                |                    | 10303                         | water birch-currant             |
| Poan3-Pienl/Diin               |                    | 10305                         | twinberry                       |
| Poan3/Phmo-Pavi                |                    | 10304                         | mountain ninebark-chokecherry   |
| Poan3/Saex-Befo                |                    | 10302                         | coyote willow-water birch       |
| Poba                           |                    | 109                           | balsam poplar/                  |
| Poba/Swse                      |                    | 10901                         | redosier dogwood                |
| Posa-Powi-Pofr2                |                    | 104                           | broadleaf cottonwoods/          |
| Posa/Riam                      |                    | 10404                         | American black currant          |
| Posa/Syoc-Leci                 | Syoc               | 10401-0                       | snowberry-giant wildrye         |
|                                | Swse               | 10401-1                       | redosier dogwood                |
| Posa/Syoc-Saex                 |                    | 10405                         | snowberry-coyote willow         |
| Posa/SALI                      |                    | 10403                         | willow                          |
| Posa-Poan3/SALI                |                    | 10402                         | willow                          |



|                     |        |         |                               |
|---------------------|--------|---------|-------------------------------|
| W                   | (none) | 2       | WOODLANDS                     |
| S                   |        | 3       | SHRUBLANDS                    |
| Acgl                |        | 330     | Rocky Mountain maple/         |
| Acgl/Swse           |        | 33001   | redosier dogwood              |
| Alint               |        | 323     | thinleaf alder/               |
| Alint-Befo/SALI     |        | 32301   | river birch/willow            |
| Alint-Begl/Caaq     |        | 32302   | bog birch/water sedge         |
| Alint-Sadr/Eqar     |        | 32303   | Drummond willow/horsetail     |
| Alint/Swse          |        | 32304   | redosier dogwood              |
| Begl                |        | 329     | bog birch/                    |
| Begl/Casc2          |        | 32901   | "cliff" sedge                 |
| Begl/Popul          |        | 32902   | skunkleaf polemonium          |
| Diin                |        | 331     | twinberry/                    |
| Diin/Caca           |        | 33101   | bluejoint reedgrass           |
| Pefl                |        | 311     | shrubby cinquefoil/           |
| Pefl/Dece           |        | 31104   | tufted hairgrass              |
| SALI                |        | 314     | willow/                       |
| Saam-Saphp/Ashe     |        | 31411   | peachleaf-planeleaf/aster     |
| Sabol-SALI/Caca     |        | 31418   | Booth/bluejoint reedgrass     |
| Sabol-SALI/Caut     |        | 31417   | Booth willow/beaked sedge     |
| Saca6-SALI/Caaq     |        | 31427   | willow/water sedge            |
| Sadr/Caca           |        | 31426   | Drummond/bluejoint reedgrass  |
| Saex-SALI/Caca-Eqar |        | 31424   | coyote/bluejoint-horsetail    |
| Saex-SALI/POA       |        | 31412   | coyote willow/bluegrass       |
| Sage-SALI/Caca      | Caca   | 31402-0 | Geyer/bluejoint reedgrass     |
|                     | Dece   | 31402-1 | tufted hairgrass              |
| Sage-SALI/Caut      |        | 31413   | Geyer willow/beaked sedge     |
| Sage/Popa           |        | 31416   | Geyer willow/fowl bluegrass   |
| Sag11/Acro          |        | 31415   | grayleaf willow/golden avens  |
| Sag11-SALI/CARE     |        | 31409   | grayleaf willow/sedge         |
| Sag11-Sabrl/Dece    | Dece   | 31408-0 | grayleaf-barrengrnd/hairgrass |
|                     | Popul  | 31408-1 | skunkleaf polemonium          |
| Salu/Eqar           |        | 31425   | yellow willow/field horsetail |
| Sapel/Thpal         |        | 31404   | meadow willow/marshfern       |
| Saphp/Cale1         |        | 31401   | planeleaf/marsh-marigold      |
| Saphp/Caaq          | Caaq   | 31405-0 | planeleaf willow/water sedge  |
|                     | Dece   | 31405-1 | tufted hairgrass              |
| Saphp/Casc2         |        | 31406   | planeleaf/"cliff" sedge       |
| Saphp/Dece          |        | 31414   | planeleaf/tufted hairgrass    |
| Sawo/Caca           |        | 31421   | Wolfs/bluejoint reedgrass     |
| Sawo/Caaq           |        | 31419   | Wolfs willow/water sedge      |
| Sawo/Caut           |        | 31420   | Wolfs willow/beaked sedge     |
| Sawo/Dece           |        | 31422   | Wolfs willow/tufted hairgrass |
| Sawo/Frv1           |        | 31423   | Wolfs willow/strawberry       |
| Swse                |        | 328     | red-osier dogwood/            |
| Swse/Diin           |        | 32802   | twinberry                     |
| Swse/Hesp           |        | 32801   | cow-parsnip                   |
| G                   |        | 4       | GRASSLANDS                    |
| Ange                |        | 403     | big bluestem/                 |
| Ange/Soav           | Sppe   | 40302-1 | cordgrass                     |
| Caca                |        | 410     | bluejoint reedgrass/          |
| Caca/Casa2          |        | 41001   | Sartwell sedge                |
| CARE                |        | 412     | sedge/                        |
| Caaq/Cahol          |        | 41230   | water sedge/Hood sedge        |
| Caaq/Caut           | Caut   | 41201-0 | water sedge/beaked sedge      |
|                     | Elqu   | 41201-1 | spike-sedge                   |
|                     | Caaq   | 41201-2 | water sedge                   |

|                 |       |         |                              |
|-----------------|-------|---------|------------------------------|
| Caaq/Pegrl      |       | 41206   | water sedge/elephant-head    |
| Cami3/Bivi      |       | 41212   | sedge/viviparous bistort     |
| Cami4/Dece      |       | 41231   | smallwing sedge/hairgrass    |
| Cane/Caaq1-Juar |       | 41215   | Nebraska/brookgrass-rush     |
| Cane/Dece       |       | 41220   | Nebraska sedge/hairgrass     |
| Caprl/Caaq      | Caaq  | 41229-0 | teachers' sedge/water sedge  |
|                 | Elqu  | 41229-1 | spike-sedge                  |
| Casc2/Cale1     | Cale1 | 41205-0 | "cliff" sedge/marsh-marigold |
|                 | Rhin  | 41205-1 | kingscrown                   |
| Casi/Dece       |       | 41219   | sedge/tufted hairgrass       |
| Caaq1           |       | 440     | brookgrass/                  |
| Caaq1/Caaq      |       | 44001   | water sedge                  |
| Dece            |       | 415     | tufted hairgrass/            |
| Dece/Cale1      | Cale1 | 41501-0 | marsh-marigold               |
|                 | Raal  | 41501-1 | plantain-leaf buttercup      |
| Dece/CARE       | Cane  | 41502-0 | Nebraska sedge               |
|                 | Caaq  | 41502-1 | water sedge                  |
|                 | Cal1  | 41502-2 | sheep sedge-bistort          |
| ELEO            |       | 417     | spikesedge/                  |
| Elpa/CARE       |       | 41701   | sedge                        |
| JUNC            |       | 423     | rush/                        |
| Juar/CARE       | CARE  | 42301-0 | Baltic rush/sedge            |
|                 | Cane  | 42301-1 | Nebraska sedge               |
|                 | Dece  | 42301-2 | tufted hairgrass             |
| Juar/Disp       |       | 42304   | Baltic rush/saltgrass        |
| Judr/CARE       |       | 42302   | Drummond rush/sedge          |
| Phco            |       | 427     | reed/                        |
| Phco/Calal      |       | 42701   | lake sedge                   |
| Puai            |       | 437     | Nuttall alkali-grass/        |
| Puai/Trma       |       | 43701   | shore podgrass               |
| SCIR            |       | 433     | bulrush/                     |
| Scam/CARE       |       | 43301   | American bulrush/sedge       |
| SCIR/Disp       | Disp  | 43302-0 | alkali bulrush/saltgrass     |
|                 | Sppel | 43302-1 | prairie cordgrass            |
| Sppel           |       | 438     | prairie cordgrass/           |
| Sppel/Caca      |       | 43801   | bluejoint reedgrass          |
| F               |       | 5       | FORBLANDS                    |
| Cale1           |       | 511     | marsh-marigold/              |
| Cale1/C1rh      |       | 51101   | kingscrown                   |
| Caco2           |       | 512     | heartleaf bittercress/       |
| Caco2/Cale1     |       | 51201   | marsh-marigold               |
| Meci            |       | 515     | mountain bluebells/          |
| Meci/Dece       |       | 51501   | tufted hairgrass             |
| Prpa2           |       | 517     | Parry primrose/              |
| Prpa2/Dece      |       | 51701   | tufted hairgrass             |
| SAXI            |       | 518     | saxifrage/                   |
| Saod/Dece       |       | 51801   | tufted hairgrass             |
| SENE            |       | 519     | groundsel/                   |
| Setr/Lifi       |       | 51901   | arrowleaf gr./ligusticum     |
| Tral            |       | 521     | globeflower/                 |
| Tral-Lifi/Erpel |       | 52101   | fernleaf ligusticum/fleabane |
| Tyla            |       | 507     | common cattail/              |
| Tyla/Sala       |       | 50701   | common arrowhead             |



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